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in The
DEPARTMENT OF THE INTERIOR

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CONSERVATION
IN THE
DEPARTMENT OF THE INTERIOR

Modern Indian Mother and Child

CONSERVATION

IN THE

DEPARTMENT OF THE INTERIOR

By

RAY LYMAN WILBUR
SECRETARY
and
WILLIAM ATHERTON DU PUY
EXECUTIVE ASSISTANT

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CHAPTER I

IRRIGATION

THE western third of the United States grapples always with one stern fact that does not assail areas farther east. A limiting influence exists in the block of States between Kansas and the Pacific, Canada and Mexico—a region 1,000 miles wide and 2,000 miles long—that clips the wings of its possibilities. Because of it plant life is inclined to languish there, animals appear but fleetingly, and human habitations group themselves only in occasional clusters. Out West there is a shortage of water.

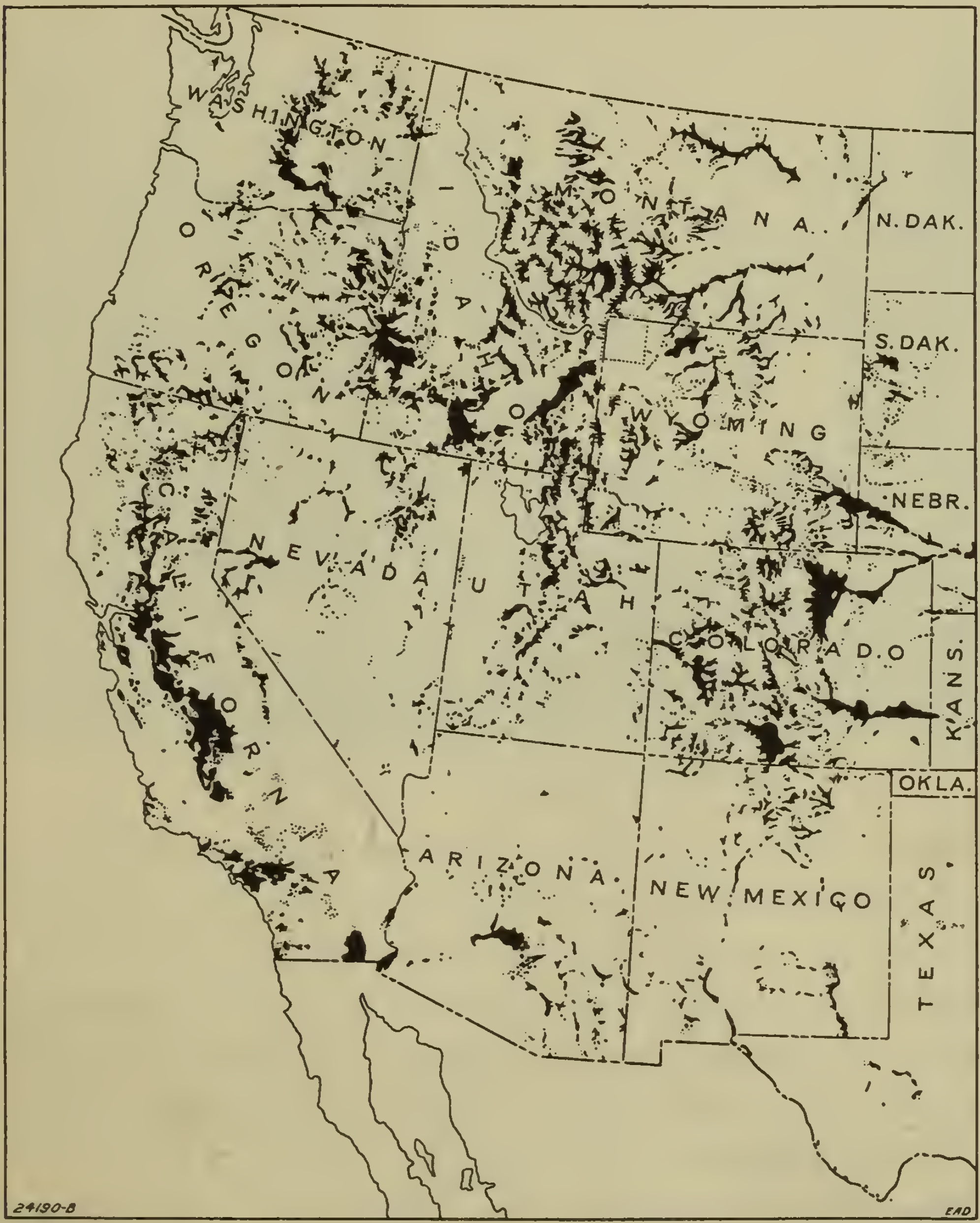
The 1,000 miles immediately to the east, nursed in the arms of the Mississippi, deep spread with alluvial soil, equitably rationed as to rain and sunshine, draw greater wealth from Mother Earth than does any other area in the world. The stretch on the Atlantic, adequately watered but less productive agriculturally, nourishes an industrial multitude.

There are 11,000,000 people in the western belt, 57,000,000 in the middle western belt, and 52,000,000 in the eastern belt. And population and production are low in the westernmost strip only because it is short of water.

Long ago this region settled up to the natural water line; it since has been able to grow only as man, exercising his ingenuity, raised that level. In two-thirds of the Nation water and to spare is always available. Little thought need be taken of it. But in the West it is the one element by which

Before Irrigation Came

development is measured, and it will remain so through all the years to come. Water is life beyond meridian 100.



The Irrigated Lands in the West Are in Black

Only in occasional spots in this great area is there enough rainfall to produce dependable crops without irrigation.

Nature's sprinkling pots bring from 6 to 12 inches of precipitation a year, whereas in Connecticut they deliver 45 inches, in Indiana 40, and in Georgia 48.

Choice Apples Replace the Sagebrush of Yesterday

Ninety-six per cent of the area west of the one hundredth meridian must resign itself to these limited gifts of the lands and forever remain sparsely populated and of low productiveness. But there are exceptions. An area of 30,000,000 acres, as big as the State of New York, is so disposed that by artificial means it can get more of the precious water of the waste lands than falls upon it.

When water makes all the difference between barren desert, where the solitary saguaro stands sentinel, and carloads of strawberries in the early spring, it is obviously a matter of primary importance. Stripped of its lesser essentials, the problem of the West is water. When and where and how much may the water line be raised?

Take the Yakima Valley, in the State of Washington, for instance, as an element in the 4 per cent of western land that may be irrigated. The Yakima River is born of the snows on the east slope of the Cascade Range and flows 175 miles through an open valley where volcanoes of the past have piled ashes 200 feet deep, rich with plant food, to join the mighty Columbia. Little rain fell here, and nothing but sagebrush grew. Man came, diverted the stream flow, developed irrigation. The result was that 100,000 people are living on 600,000 irrigated acres in an area where almost none found homes before.

These homes cluster among the apple orchards where a production yielding $200 per acre per year is not unusual. There is that in the volcanic ash, the sunshine, and dry weather which gives these apples a rosiness of cheek, a firmness of flesh, and a keeping quality that have carried them into the market places of Yokohama, Rio de Janeiro, Cairo, and Danzig on the Baltic. The baled hay and the big baking potatoes of these farms feed nonagricultural activities all about. A city of 22,000 people and a score of thrifty towns exist where but yesterday sagebrush was supreme.

Far to the south, in the burning deserts of Arizona, as a dot in a waste that is unbroken between El Paso and Los Angeles, lies Salt River Valley, Eden of the borderland. Here in the beginning an erratic stream came out of the mountains, sometimes ran a roaring torrent but mostly seeped languidly into thirsty sands. Inspired by the Government's need for hay for Army mules, some rugged frontiersman, back in the seventies, led a ditch from Salt River onto the desert and demonstrated the heavy yields where water is wedded with the desert silt. Ditches became canals, these multiplied themselves. Salt River Valley grew up to the water line which they established and boasted 20,000 people.

But the water supply was irregular, and floods ripped out diversion dams. The Government, 25 years ago, began its first great demonstration of welding mountains together, impounding flood waters, distributing them as needed, stabilizing the behavior of torrents, setting them to spinning turbines, developing communities under this new influence.

Oranges Born of Irrigation

The enterprise has transformed this cactus-studded desert solitude into an intensively farmed, unbelievably productive, cosmopolitan community that has no counterpart in all the world. Living here are 130,000 people, 50,000 of them in Phoenix, the metropolis of the Colorado River Basin. Farming such lands as these has called forth a skill beyond the appreciation of tillers of eastern acres. Early lettuce goes out in refrigerated trainloads. Single acres have been known to produce 700 boxes of grapefruit. Alfalfa, heritage of the early Spanish fathers, yields six crops a year. Date trees ripen their honeyed fruit in the city parks. Long-staple Egyptian cotton surpasses that picked along the Nile. Production per acre on these irrigated lands of the warm Southwest is likely far to surpass that known in most parts of the world.

The Snake River winds its tenuous way through Idaho and Oregon, carrying much water and inviting man to apply his ingenuity to it. He has responded by raising the water level in the Snake River Valley, and as a result 250,000 people live where before there was nothing of value at all.

Where the Rio Grande runs through New Mexico the early Spaniards developed a ditch here and there and built scattering adobe homes. The Government threw the most massive of its concrete dams across the Rio Grande at Elephant Butte, stored the floods, induced a steady flow—and brought prosperity to peaceful, semi-Latin communities that fringe the river for 150 miles.

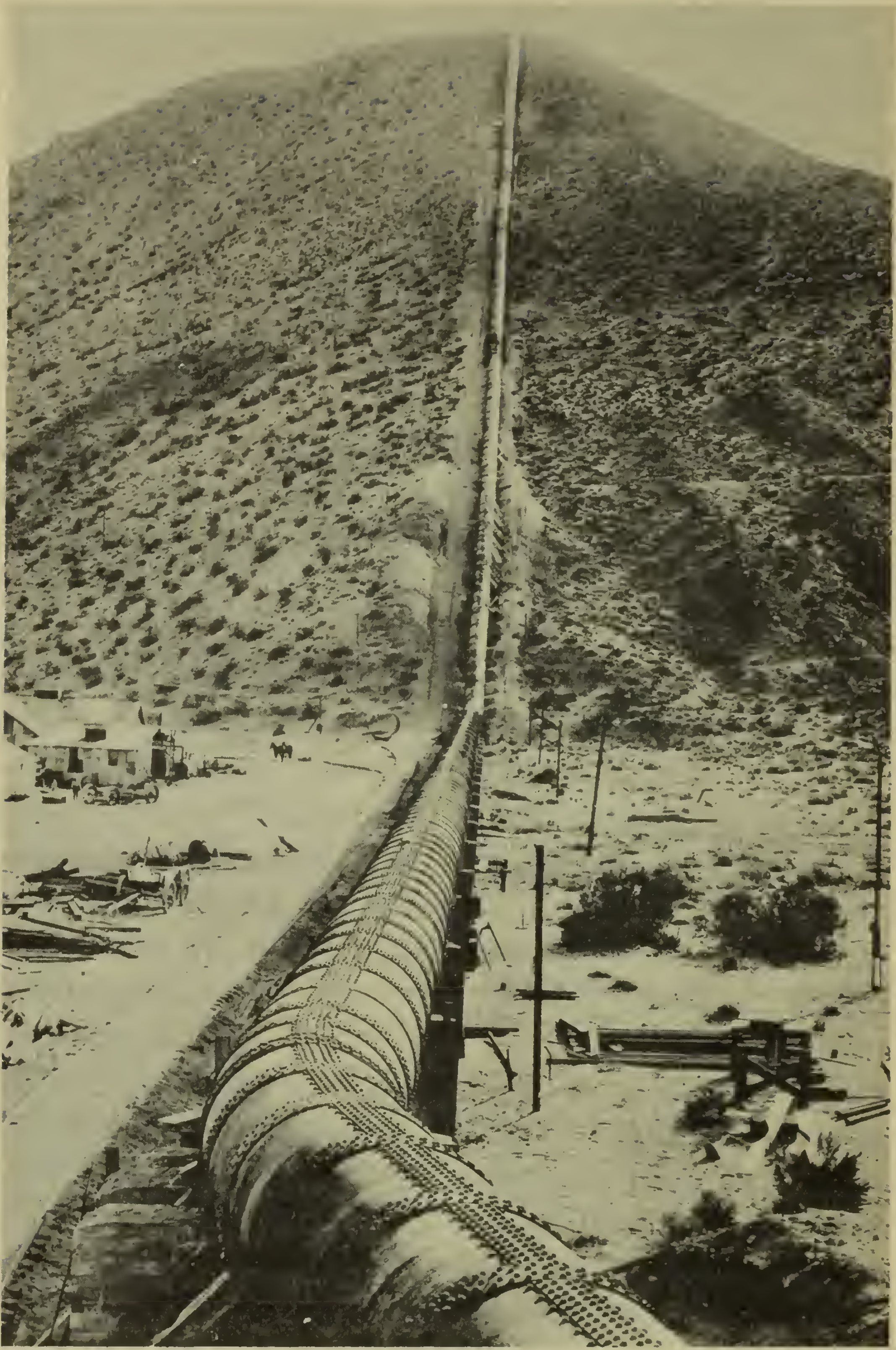
But ahead of all these was Brigham Young, who, traveling with his caravan on the way to Utah, told Jim Bridger, frontier scout, that he intended to plant a farming community beyond the mountains. Bridger pooh-poohed the idea and offered a thousand dollars for the first ear of corn that was grown.

But for Irrigation the Site of the Mormon Tabernacle in Salt Lake City Would Be Barren Desert

It was July 24, 1847, and the plains were parched when these pioneers, after crossing Immigration Canyon, came out into Salt Lake Valley and unhitched their teams on the brink of a merry little stream afterward known as City Creek. That same afternoon they took their plows off their wagons and broke some of this dry desert land. The very next day the stream was diverted, the plowed land irrigated, and a batch of potatoes planted. This, it seems, was the first bit of irrigation ever undertaken by Anglo-Saxons.

Here in the Great Basin wastes, out of which no stream finds its way, grew the first of the communities born of water under the hands of this race. Various streams coming out of the Wasatch Mountains were diverted and used for irrigation. Later a dam was thrown across the mouth of Utah Lake, 25 miles away. It was converted into a reservoir and tapped by canals which irrigated fertile fields below. Scores of expedients have been used to add to the water supply of the Salt Lake Valley. Each has contributed to the prosperity of this oasis and made additions to the population possible. To-day 200,000 people live in this region, which would have supported but a handful had man not taken thought of water and led it here to serve his purposes.

The classic example of how communities mount step by step as the water line is raised is furnished by the Los Angeles district. Here the Spanish settled 150 years ago and developed a pastoral civilization of a few thousand; the rainfall was not sufficient for stable crop production. Americans who followed increased the water supply by diverting the Los Angeles River into irrigation ditches and by



Los Angeles Adds to Its Water Supply

pumping from shallow wells. By 1910 the population had run up to 300,000. It looked as though this community might provide water for drinking, for sprinkling lawns, and for Saturday-night baths for 50,000 or so more people; but the end was in sight.

It was then that Los Angeles reached out beyond its own watershed, far across the Mohave Desert, 250 miles to the point where the Owens River, fed by the snows of the Sierras, was wasting itself into a brackish lake. Los Angeles diverted this stream and led it through the longest aqueduct in the world into her own front yard, there to multiply the crops of oranges, bungalows, and settlers. Because of this water, brought into the area where it could serve its maximum purpose, 2,000,000 people were added in 20 years to the Los Angeles area. But the population was again approaching the water line. The capacity of the aqueduct could be increased, and probably 500,000 more people could be adequately supplied.

The Los Angeles district thus faced a predicament. In Imperial Valley, not far away, below sea level in a desert as absolute as exists anywhere in the world, nestled another community, born of water, that was likewise in a predicament. It grew of irrigation from the mad Colorado, and now that stream threatened to break from the silt-built ridge upon which it rides and engulf its child. The Government, fortified by its own rich experience and that of private enterprise, accepted the challenge of this great stream to come and shackle it.

Hoover Dam will not end the list of development enterprises in the West. The control of the Columbia River in the Oregon-Washington region is a bigger problem than that presented by the Colorado. The lower Rio Grande offers a dam site in the Big Bend country between Texas and Mexico that is international and might raise the water line all the way to the mouth of the stream. The "Great Valley" of the Sacramento and San Joaquin Rivers, in California, calls loudly for comprehensive control. Sixty or seventy projects, scattered all over the West, have been presented to the Reclamation Service and invite development. Private enterprise is utilizing many more.

The Mad Colorado Gnaws at Its Banks

There is a strange magic in this conservation of occasional floods that run riot in the land of thirst. It causes concrete giants to grow where nothing else will. Strange substitutes are these giants for the fairies of old who brought about transformations through the waving of wands. Yet the proof of the reality of their miracles is secured first-hand by any doubter who cares to go to see.

There are those who oppose the reclamation of these lands on the ground that, in these United States, there are already too many farms. This may be true of parts of the Nation, but not of the West. One-third of the area of the country is almost without farms. West of Kansas there are but occasional spots, amounting to 4 per cent of the area, that can ever be farmed. To withhold from this vast region the cultivation of those small valleys that lend themselves to irrigation would inflict great deprivation on it and interfere with all manner of western development.

Arrowrock Dam in Idaho

Irrigation from the Government standpoint is handled by the Reclamation Service, in the Department of the Interior, which is custodian of a revolving fund amounting on June 30, 1931, to $151,694,000. This fund is used for the development of irrigation projects in the West. The Reclamation Service develops these projects, and they afterwards return the money, which is put into new projects. There are twenty-five of these Federal irrigation projects, irrigating a million and a half acres, divided into 40,000 farms.

Irrigation Brings Production to the Desert

The crop value on them in 1930 was $65,000,000, and they support a population of nearly half a million people. The fund was created in 1902, when much of the land to be reclaimed was Government land. Lands that have any chance of such reclamation are now largely in private ownership. Their development has become the concern of their owners and of the local community, and new bases of State, private, and Federal cooperation are being worked out. Taking that development to Washington and turning it over to the Government would furnish an example of paternalism and bureaucracy carried to the extreme.

From the standpoint of the modern-day conservation, the problem of reclamation should be resurveyed and a new set-up established in the light of the changed conditions that have been brought about during the past quarter century. The proper use of this reclamation fund may lie in the building of dams—the establishment of lakes that store water; and the application of that water to the land may be shown to be a local or State matter. If further study confirms this theory, the Federal Government will be able to devote itself and its revolving fund to the task of stopping this precious water, leaving its distribution to local interests.

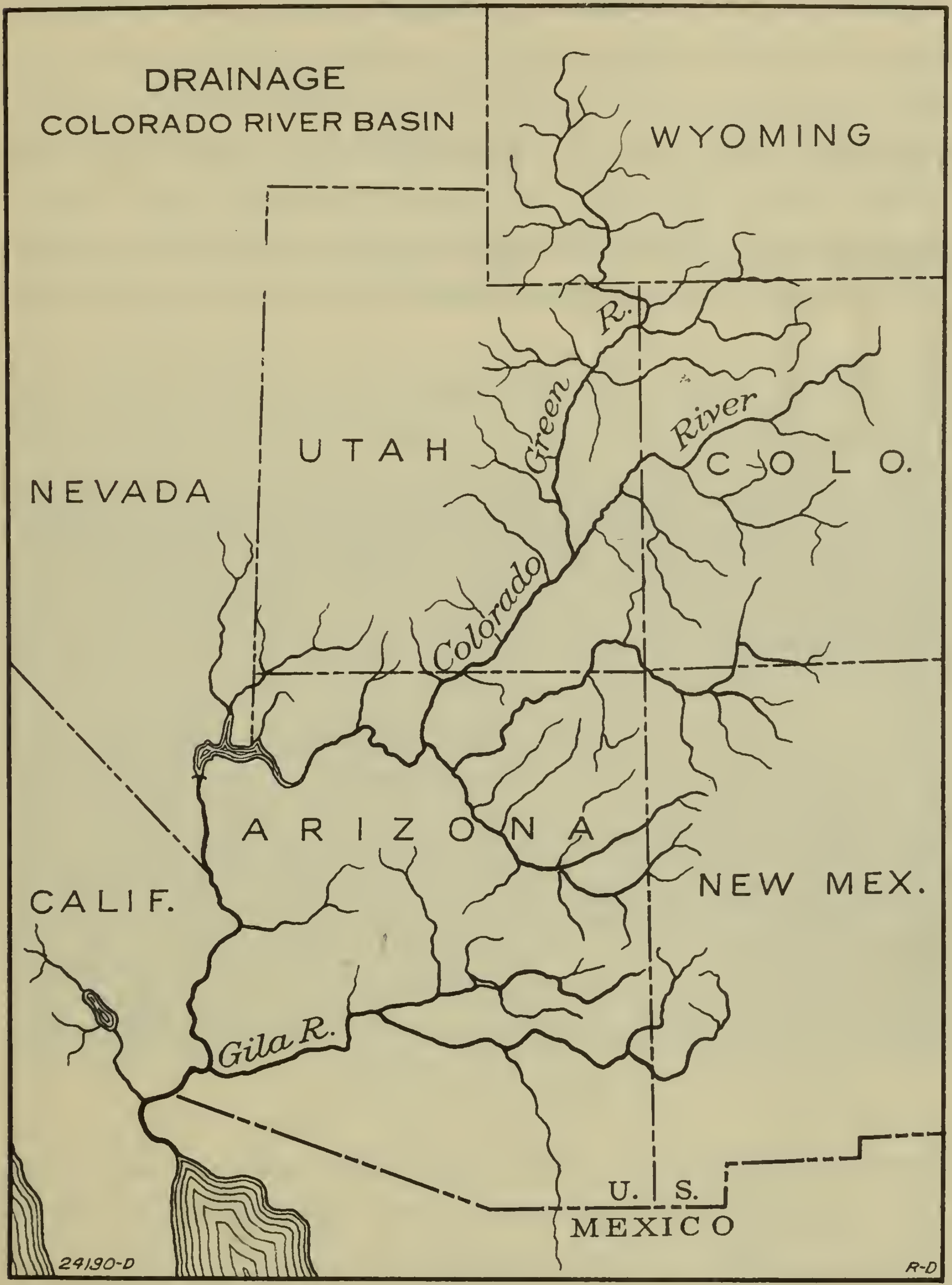
Those dams which stop the floods of the West and put them in pockets for use when needed are but a part of the scheme which looks to the conservation of water in that part of the Nation that is too dry. The whole western area requires consideration from the standpoint of increasing its orderly yield of water that may be used for irrigation.

CHAPTER II

SHACKLING THE COLORADO

THE basin of the Colorado River covers approximately one-thirteenth of the area of the United States. It is half as big as the region that lies east of the Mississippi. It is equal in size to New England, plus all of the Middle Atlantic States, with Ohio and Indiana thrown in. But it has largely run to waste. It is the least developed and the most sparsely inhabited portion of the country. It has a population only equal to that of the tiny State of Rhode Island.

The remotest headwaters of the Colorado appear where the Green River taps certain crystal, ice-fed lakes in the Wind River Mountains of Wyoming, and where the main stream chooses Longs Peak, the highest in Colorado, to stand as a monument at its very source. Both streams frolic through high mountain country, their waters occasionally diverted for purposes of irrigation. They flow into the plateau region which, the geologists say, has slowly risen a perpendicular mile because of the inner pressure of the earth. But as it has come up the swift waters of the Colorado have eaten their way into it and have cut to the depth of a mile through its varying strata. The walls have tumbled in to widen the gorge. Tributaries have ripped their auxiliary, bizarre excavations—and the Grand Canyon came forth as the greatest earth-carving demonstration water ever gave.



The Drainage Basin of the Colorado River

Then the mad river becomes a sullen, clumsy, lowland stream, from the banks of which thorned desert plants get the only glimpse of water ever vouchsafed in this corner of the world. But as the mad stream, now grown morose, nears its end it performs one final fantastic feat. It builds itself a trough of silt in which to run, a trough which, strangely, looks down from its high elevation—hundreds of feet—upon the plain that stretches away into California. The silt which makes the Colorado muddy stops here as the waters slow down to build the land. It was thus that the stream built a dam across the Gulf of California ages ago and left its upper end (in what is now the United States) to dry out and become the Imperial Valley of to-day, with Salton Sea, 204 feet below the ocean level, at its feet.

The Silt-Eating Lower Colorado

Private enterprise has here developed an irrigation canal which, for engineering convenience, runs for 60 miles on

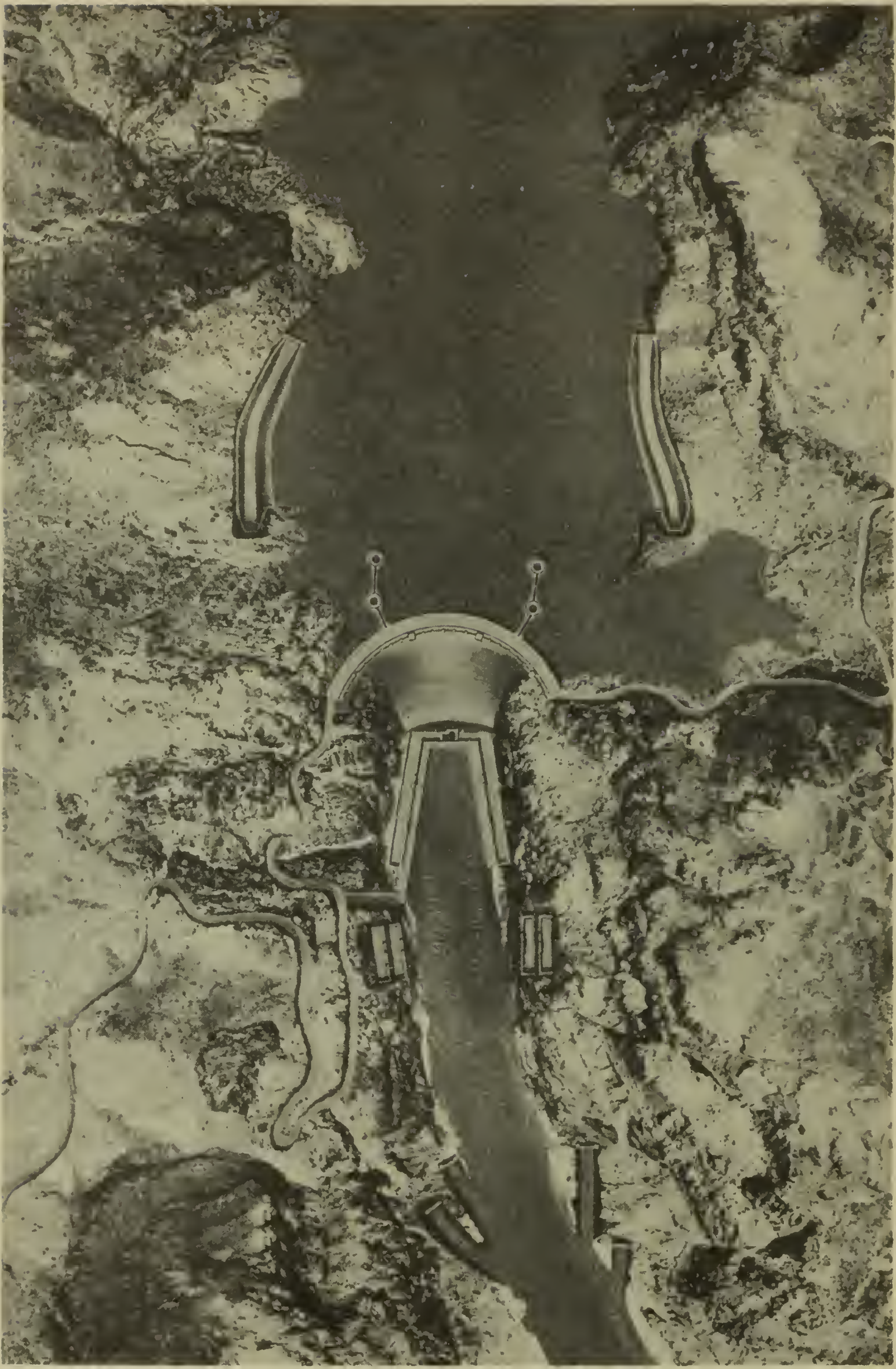
Mexican soil. Its builders pledged certain water to Mexico for the privilege of looping this canal across its border. Then they brought their canal back to the American side and spread its waters out until they irrigated 400,000 acres, worth $100,000,000, and furnished homes for 60,000 people. The yield of this land is prodigious. Its crops are earlier and more tropical than those grown elsewhere in the United States.

But the mad river in its sand trough looks down in constant menace on these cultivators of the silt-lined valley.

Such was the situation into which, throughout the past two decades, the Government was asked to look as into a crystal ball and behold the vision. Yet it was strange that those who conjured up that vision were not medieval magicians but modern engineers with slide rules, water gages, and blue prints. The vision became definite plans which were approved by congressional action carrying appropriations to convert dreams into realities. The unprecedented features of this undertaking to which the Government has set its hand and on the details of which it has already decided may now be described.

The central feature is the great Hoover Dam, the best location for which, all aspects of the problem considered, was found at Black Canyon, 30 miles north of Needles, Ariz., and 30 miles east of Las Vegas, Nev., its nearest railroad point. This is below the Grand Canyon section of the river—upon which it will have no effect—among barren desert hills, blistering in the sun.

The job, the major portion of which is being executed under a single contract, will cost more than a hundred million dollars, including work and materials. About half of



Hoover Dam and Appurtenant Works as They Will Appear When Finished this will go to the contractor for the work, and the Government will spend the rest for the makings. The job begins with four mile-long tunnels to run around the base of the dam through the solid rock of the mountain. When these are completed a cofferdam 80 feet high must be built to turn the river, even when the floods come, to go roaring through these tunnels. Another dam must be put below the site to keep these waters from backing up. Thus will a dry stretch half a mile long, in which the dam is to rest, be created. The débris that has settled in the bottom of the river, 140 feet of it, will have to be lifted out. Power houses, elevators running to the top of the mountain, railroads up and down the canyon, are all a part of the plan.

The Gap to Be Filled In by Hoover Dam

The biggest single contract that the Reclamation Service ever let before was that for the construction of Owyhee Dam in Idaho, which cost $6,000,000. It will cost almost that much to excavate one of these four tunnels that are to run around Hoover Dam. They are to be 50 feet in diameter, drilled through hard and solid rock. Two 4-story city houses could be set in the mouth of one of these tunnels and lots of room would be left at the sides.

Driving one of these tunnels the size of a shady village street for a mile through this rock will take some time, and the big dam can not be started until the river is running through them. The contractor for each will work from both ends and from the middle, at sixteen places in all. In tackling this mountain face the contractor's chief weapon is dynamite. Its skillful use will leave walls that can readily be lined with concrete.

But blasting out the rock is but part of the job. That rock must be disposed of, and here they are in a canyon not unlike Broad Street, in which there must be no obstruction and traffic must be kept moving. It is 2 miles down the canyon before it opens out at all. It may be necessary to haul this rock 6 miles before it is dumped, and 13 miles of railway will be built in the canyon walls just to move this broken material. And there is 2,000,000 cubic yards of it, which is considerable rock.

When the tunnels are finished the upstream cofferdam will be thrown across the river to send it through these artificial courses. This dam will be built chiefly of rock and earth and will be 80 feet high. When it has taken form it will be given a rock facing 3 feet thick and an apron of reinforced concrete paving 6 inches thick will be thrown over it. Then along its toe steel sheet piling will be driven in such a way as to make a water-tight cut-off wall reaching far underground. The actual diversion of the river will be made at a time of low water and the dam will be strengthened to rebuff the floods. There is here a sporting venture, however, in which the Government assumes the risk. This cofferdam is equal to any flood that is likely to come, to any high water that has been known to the white man. Once in a thousand years, it is admitted, phenomenal situations arise. Engineers say they have a way of coming at the wrong moment. The one overwhelming flood of the centuries might occur after this cofferdam is in. The great tunnels might not be sufficient to carry off its volume. The water might sweep over this dam and destroy the mere house of cards that puny man was building in the river bed below. If it should do so, the Government and not the contractor would have to carry the burden of loss.

This Sort of Scene Lies Upstream from Hoover Dam

But taking it that the cofferdam will be in and the river diverted two years hence, the next task will be clearing out the débris that rests on bedrock. The cofferdams are half a mile apart. In the bottom of the great trough of the river is a deposit of bowlders and gravel 140 feet deep resting on bedrock. The bottom of the dam is to be 650 feet long up and down the river. With the necessary slopes for approaches and elbow room in which to work, the trough will have to be cleaned out for 1,000 feet. With all the men and machines that can be got into this space, it will take them a year, working antlike, to clean the canyon down to bedrock. When this is done the solid rock of the bottom and sides of the gorge will be worked over to insure the cleanness and soundness of every spot, much as a dentist works over a cavity in a patient's tooth before he

There Are Few More Striking Nature Carvings Than Toroweap in the Lands Upstream puts in a filling. Not only this, but deep trenches will be cut into the bedrock, into which the dam may be tied to add to its strength. The whole will be gone over with brushes, water, and compressed air to insure absolute soundness.

When the foundation is thus prepared the laying of concrete for the great dam will begin. To give an idea of the size of this undertaking, it may be said that the 4,400,000 cubic yards of concrete that is to be used in the dam, power plant, and appurtenant works is more concrete than the Reclamation Bureau has used in all its other projects combined in the 29 years of its existence. The Government will buy and supply to the contractor the 5,500,000 barrels of cement needed in the manufacture of this concrete. The contractor must go up the river some 8 miles to a natural gravel deposit and get his own gravel. He must bring it to the dam site and mix his own concrete. This in itself will require a huge plant.

From there on the big job will be one of mixing and pouring concrete. Besides the bulk of the task there are such fine points in construction as so pouring this concrete that expansion and contraction due to heat will not leave cracks which might start leaks in the structure. At times the weather temperature here in the canyon may be 120 degrees. Concrete as it sets undergoes chemical action that generates heat and increases its temperature some 50. degrees. Heat expands the concrete, and it will contract as it cools and may leave cracks and open spaces. To avoid this the dam is to be refrigerated as the concrete is laid. Pipes are to be run through the 50-foot-square blocks as they take form and refrigerating fluids are to be forced through the pipes. The temperature of the concrete will be kept down so it will not expand. This concrete will occupy a space that is almost exactly equal to that it will fill when the job is done. The dam will be built up in these 50-foot blocks. If there are cracks, they will come between the blocks. They will be found and grout under high pressure will be forced into them. This grout is liquid concrete and will be made to fill every cavity in the dam.

As the dam ascends work will also be going ahead in the development of the power houses below it, which are a part of the construction, and the sale of power from which will ultimately repay the Government every cent put into this enterprise. There are to be 1,100 feet of these power houses across the base of the dam and in wings extending 500 feet down each side of the canyon. When the dam is halfway up, the cofferdam above it will be blown out and the water let in against it. Thus the reservoir may be started on its work of storing water in advance of the completion of the project. As soon as it has raised the water to a sufficient level, it may be diverted through the penstocks and the power houses and the generation of electricity for local use and even for sale to the outside world may begin. Thus a revenue from the dam may be derived for a year before it is completed.

The quantity of concrete consumed by the dam decreases rapidly as its height increases. It finally narrows to a width of 45 feet at the top, as compared to 650 feet at bedrock, 730 feet below. Thus it appears that if the Washington Monument, which is 555 feet tall, were set on bedrock beside the dam, it would reach but a little more than two-thirds of the way up its front. The Woolworth Building, 792 feet high, would barely overtop it.

At its crest the dam will be 1,180 feet long, spanning the gap between Arizona and Nevada. The whole structure arches gracefully, with its back upstream, which fact gives it enormous strength to resist the pressure of the water that will pile up back of it.

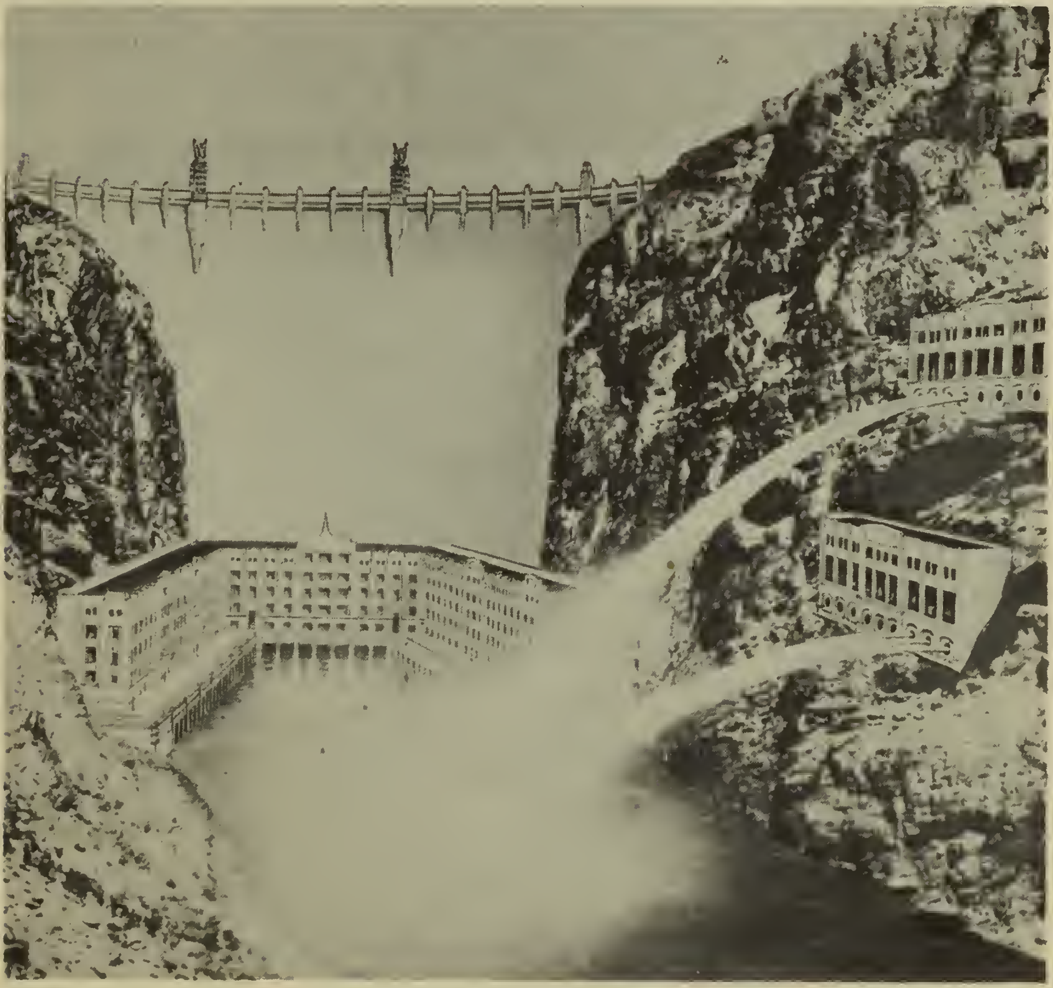
Far Downstream Salton Sea, 204 Feet Below Sea Level, Bids for the Waters of the Colorado

When the dam is completed two links of a transcontinental automobile highway will have been built up to its respective sides. The top of the dam will be used as a bridge over the gap of the Colorado. It is taken that, when this highway is open, the majority of the automobiles that cross these States will come by the dam, for it will constitute one of the wonders of the West.

After the dam is completed the automobile tourist coming from the East will break through low, barren desert hills on the Arizona side and come suddenly on the border of this, the largest artificial lake in all the world, stretching its tentacles away into innumerable canyons that reach into the most barren and solitary area in the United States. To his left, if the reservoir is full, he will see merely the crest of the great dam. Proceeding a bit farther he will come on the structure itself and will be given a look downstream where Black Canyon, robbed of its river, presents its solemn and precipitous walls for inspection. Looking over the edge of the dam where its skirt flares out, he will see the roof of the power house through which this stored water under pressure is roaring in the generation of electricity. This water finds its way through the inner tunnel on each side of the dam which was originally built for the diversion of the river. The second great tunnel on each side has been converted into a spillway. If it should happen at the time of the tourist's visit that the reservoir is full to overflowing, the surplus waters would be roaring down the spillways and discharging as a mighty torrent at the tunnel exits half a mile below. The rush of these waters under more than 500 feet of pressure would represent a titanic force such as man has never harnessed before.

If the tourist should pause for a visit of a day or two, he would find that he might take a boat up this lake for fifty or a hundred miles, leading through massive eroded plateaus that reach into the areas of the lower Grand Canyon of the Colorado. He might visit the dark canyons below the dam where the pent-up waters escape, yielding their power and going on their way to irrigate many desert acres and supplying water to many thirsty towns of the Southwest. Proceeding on his way across the dam and climbing to greater heights among the rock cliffs, he will be able to look back and view the entire panorama that has been unfolded here in the great solitudes and which in its completed form will present the most spectacular engineering accomplishment in the history of all the world.

There are three units in the entire Colorado River project—the Hoover Dam, the power houses, and the All-American Canal—with a total authorization of $165,000,000. The canal will be 200 miles down the river, will cost $38,500,000, and will be big enough to float a ship drawing 20 feet of water. It will carry water to desert lands in southern California, replacing the present international ditch, and will be the biggest irrigation canal ever built.



Downstream from the Dam When It Is Completed

The money for all of this will be advanced by the Government. The cost of the dam, power plant, and appurtenant works will be repaid with interest from power sales, contracts for which are already signed. The cost of the All-American Canal will be repaid by the water users benefited.

These stored waters of this Government undertaking give birth to another enterprise, financed locally and not by the Federal Government, that is no less spectacular and that will cost $200,000,000, to be paid by the community. Los Angeles and that group of communities between it and San Diego will take an aqueduct full of this water 225 miles across the desert, lift it 1,400 feet over a mountain range, and offer it as an added water supply to this area which will soon be built up to its water supply and would cease to grow unless this water supply were increased.

Chapter III

PUBLIC LANDS

THE United States owns a body of land bigger than Texas that is failing to play its proper part in conservation. This is the public domain of the West, one-tenth of the area of the Nation, which belongs outright to the Government. It is the residue of that sweep of territory from the Alleghenies to the Pacific, the most valuable body of land in all the world, which it has been parceling out to the American citizens through the past 100 years. A land-hungry race has picked over the public domain, choosing the best land first, much as housewives might select their fruit at market. Only the "scorns" are left.

The Government has been ignoring the possibilities that lie in its remaining public lands. It has made no adequate effort to get the proper returns from Nature's output upon this area of 300,000 square miles, which is larger than Germany, and more extensive than six States like New York. It often has allowed it to degenerate like a vacant lot in the suburbs which gives little indication of the bungalows and peonies that it might harbor.

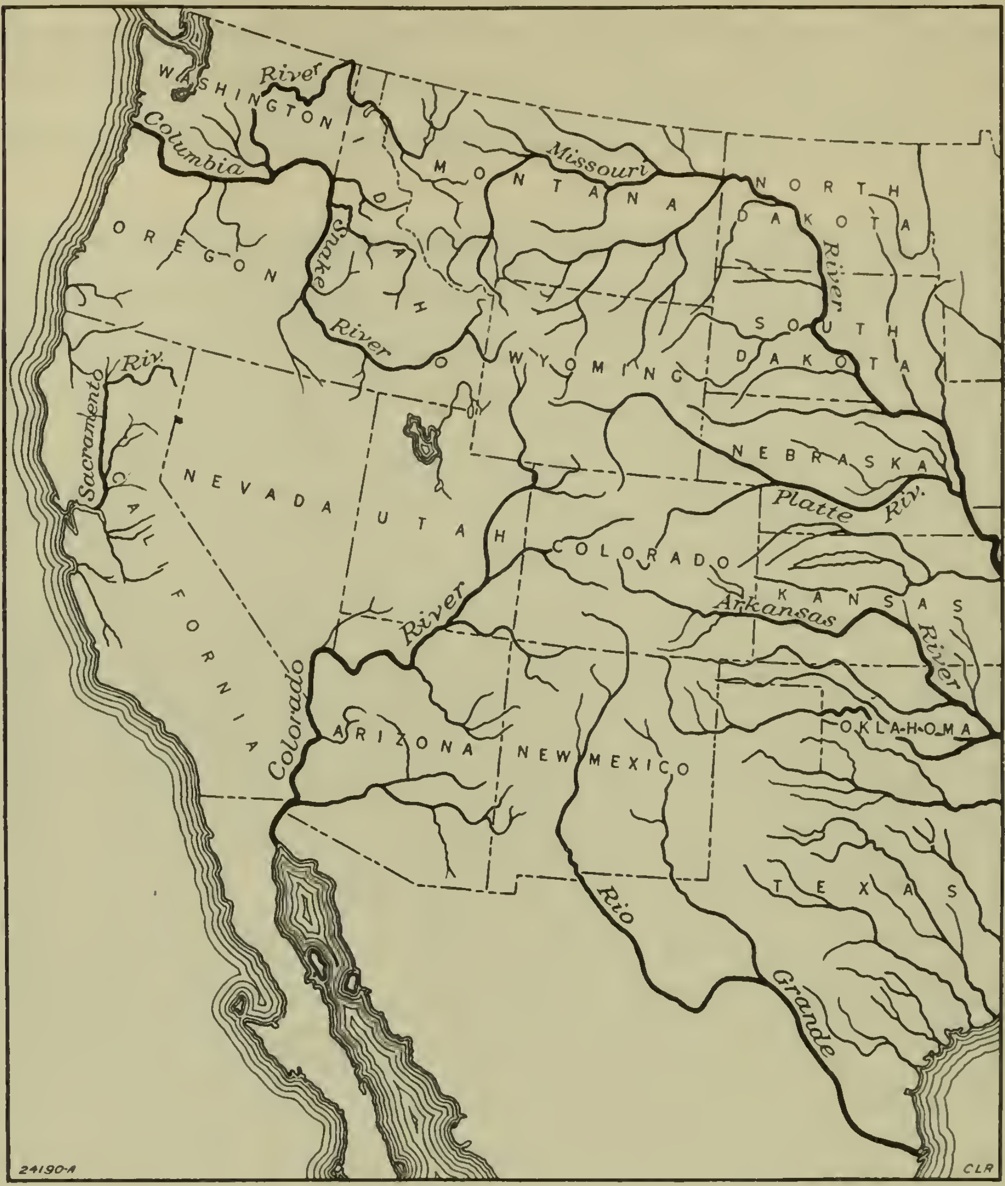
The watchword of the Roosevelt administration, which functioned so vigorously a quarter of a century ago, was conservation. The Reclamation Service and the Forest Service grew out of it. At that time President Roosevelt appointed a Public Lands Commission, which reported to him that "the general lack of control in the use of public grazing lands has resulted, naturally and inevitably, in overgrazing and the ruin of millions of acres of otherwise valuable grazing territory. Lands useful for grazing are losing their only capacity for productiveness, as, of course, they must when no legal control is exercised. Prompt and effective action must be taken if the value of very much of the remaining public domain is not totally to be lost."

A Typical Fragment of the Public Domain

Yet more than two decades have passed since this report was made and nothing effective has been done looking toward an understanding handling of the part of the public domain not included in the forest areas. Its condition is vastly worse than in the time of Roosevelt. Various proposals to improve this situation have been made. The central idea in most of them has been a Federal supervision that the range might be restored to the end that it would furnish additional pasturage for herds and flocks. This sort of supervision has been extended to the grazing lands within the national forests, and many proposals to apply it to the public domain have been made by the Department of the Interior, but they have failed of enactment into law.

The passing of years has brought to this problem a viewpoint that is somewhat different from that advocated by conservationists of the past. It sees two main possibilities in the remaining public domain. It believes, in the first place, that the ranges can be restored to the verdure of the past, when they provided much more feed for livestock than at present. This is desirable and important. It is not, however, the primary consideration. The second and more vital end to be accomplished is the restoration of the water shed to that point where it will yield the maximum of stream flow. Water in the West is more precious than gold.

Cattle on the Public Range



The Streams That Carry the Water That Brings Life to the Arid West

Water is life. The new conservation thinks of the public domain chiefly from the standpoint of the amount of water it may be induced to produce.

For a moment look upon the empire that is fed from the streams that flow from the public domain. The great Missouri River stretches its tentacles to the top of the

Continental Divide in the vicinity of Yellowstone and Glacier Parks, winds tenuously for 1,000 miles through Montana, the Dakotas, skirts Nebraska, Kansas, Iowa, and bisects Missouri. The Platte and the Arkansas come out of the Rockies farther south and strike eastward across the flat lands. The Rio Grande claims southern Colorado and New Mexico as its own and carries the possibility of irrigation to the fertile valleys that lie in two nations between El Paso and the Gulf. The mighty Colorado drains seven States and furnishes many basins in which its floods may be stored against the time of need. The Columbia River, barrier between Oregon and Washington, dips into Canada in one direction, and with its tributary, the sinuous Snake River, extending its numerous tails as far as Nevada and Wyoming, drains the whole Northwest. All these run through dead, dry lands and call them to life. The maintenance of their flow is the most important single matter in the western half of the United States.

Beginning at Taos, N. Mex., where Indian pueblos reach their maximum development, and extending 100 miles north through the wild country of the upper Rio Grande, is one of the best cattle ranges on all the Government domain. It is made up of rolling mountains, sparsely sprinkled with piñon and juniper trees, and normally matted with grama and wheat grasses. In the old days cattle grazed knee-deep in verdure, rains sank into a spongy ground covering and found their way gradually into the streams. But for a generation much of the range has been so overgrazed that much of the grass has been cropped when it appeared and has been prevented from making seed for later growth. The ground has become bare, trampled hard by much grazing.

Rainfall runs from bleak, hard hillsides marked by a multitude of worn trails as it might from a tin roof. It cuts deep gullies in them, washes the rich humus from the surface, and exposes the underlying clay. Freshets go tearing down the Rio Grande, mud laden, and this vegetation-producing soil finally comes to rest in the reservoir created by the Elephant Butte Dam, gradually decreasing its storage capacity. A splendid asset, neglected, has become a local menace.

Gala Day at an Indian Pueblo in the Rio Grande Country

The Red Desert in southern Wyoming, sitting astride the Continental Divide, is as big as the State of Massachusetts. It used to be covered with common sage, bud brush, bud sage, salt sage, winter fat, crab scale, salt grass, and wheat grass. The desert is surrounded by a rim of mountains that rise to much higher elevations than it does. The desert and the mountains have worked together, each supplementing the other, to create one of the most favorable situations for sheep raising that has existed in the United States. The flocks grazed in the mountains through the summer and came out onto the desert, where dry weather had cured their grasses and where browse was abundant, for the winter. As many as a million sheep have wintered here.

But this was open range. The time was when one sheepman took a certain area for himself and another some adjacent area. There was plenty for all, and so no crowding and no quarreling. But the numbers of the flocks increased until the Red Desert filled to overflowing. It faces the menace of overgrazing, of the destruction of its native values. Without action to save it the end is inevitable.

Buffalo on the Western Range

These are typical areas on the public domain in the West that have drifted into a sad state under the theory that Government lands are open range, to be used at will by all comers. All the public domain has suffered similarly. However, the condition that it is in at present is not necessarily permanent. If properly handled, these areas would promptly restore themselves.

An example from Montana of what they would do is cited. Back in 1909 much alarm developed about the danger of extermination faced by the buffalo of the plains. The Government purchased a tract of 18,000 acres of exhausted range land in Montana, fenced it, and put a small herd of buffalo on it. In three years the range was quite restored, and the buffalo wallowed in tall bunch grass that tickled their bellies in a way reminiscent of the days when they owned the plains.

The possibility of improving the condition of the range that has been most generally accepted through the decades is that of a supervision of these lands from Washington—such a regulation of the use of the range and a policing of it as to allow it to recover its former condition and to serve its proper purpose. A substitute theory is the transfer to those States willing to accept the responsibility of the control of the surface rights of all public lands not included in national parks and monuments or in the national forests.

In support of this latter principle it is set out that the conservation of watersheds is the fundamental issue, water the first consideration. It is held that the people of the West have had a peculiar experience in communal living and cooperative action in such matters as the development of irrigation projects. It is argued that there should be a great western strategy for the protection of watersheds and that the Western States, being water conscious, are ready to develop it.

The present situation in these Western States as to land not in the hands of individuals is next to impossible. This comes about chiefly because of the peculiar ownership of it. The land belongs to three different agencies—the Federal Government, the States, and the railroads. The situation would not be so bad if it were not for the peculiar manner in which this land has been distributed. The Government surveys mapped the western lands by townships and divided the townships into sections. There were 36 sections, each containing 640 acres, in a township. The land being thus surveyed, two sections out of each township were given to the States for the benefit of their school fund. In New Mexico and Arizona four sections per township were set aside for schools. Special grants were added for the support of universities, hospitals, and other institutions. These State lands were not awarded in solid blocks but

Waiting for Water in the Dry Country

in sections scattered throughout the public domain. Each section is completely surrounded by Government land or by land that has passed into other ownership. This makes it impossible to handle large areas in a block, and single sections are too small for consideration as grazing land.

When railroads were built through the West they were given grants of alternate sections of Government land for distances varying from 20 miles to 40 miles on each side of their tracks. Thus checkerboards were laid down in which alternate sections were owned by the Government and the railroads.

Irrigation Brought to Railroad Lands

When the situation developed to the point where the railroads might have leased their grazing lands to advantage, they found that it was impossible for them to do so. They could not inclose large areas without fencing in Government land also, and this was not permitted. The

Government has stuck to its policy of maintaining the open range and has forced it, in some instances, upon the railroad lands and grant lands as well.

Thus it develops that a greater area than that covered by Government lands falls under the pall of its mismanagement. The State lands, by and large, become open range also, are overgrazed, lose their pasturage possibilities, and deteriorate as watersheds. This adds to the public domain, already bigger than Texas, an area of State land equal to all the Middle Atlantic States, which becomes a part of the open country that is not serving its proper purpose. The railroads, being unable to inclose their lands properly to protect them from overgrazing, present an additional area as big as New England that is improperly handled. Thus, ignoring State and railroad land that has passed into private ownership, we have an expanse of land equal to Texas, the Middle Atlantic States, and New England that is not serving its proper purpose. This situation, presented in tabular form, but in round numbers in acres, would appear about as follows:

State	Remaining public lands	Lands granted to States	Lands granted to railroads
Arizona	16,900,000	8,000,000	9,400,000
California	20,200,000	5,500,000	13,700,000
Colorado	8,200,000	3,700,000	4,000,000
Idaho	10,700,000	3,000,000	2,000,000
Montana	6,900,000	5,000,000	17,500,000
Nevada	53,400,000	2,000,000	5,000,000
New Mexico	16,300,000	4,400,000	4,000,000
Oregon	13,200,000	3,400,000	4,500,000
Utah	25,100,000	5,800,000	2,400,000
Washington	1,000,000	2,400,000	11,000,000
Wyoming	17,000,000	3,500,000	5,700,000

The new conservation proposal contemplates that the Government lands shall be turned over to the States as and when they put themselves in a proper position to handle

Can the States Extract a Profit from Such Lands?

them. This means that the States must convince the Federal Government of their willingness and ability to do this, and that they must pass whatever laws and create whatever agencies that are necessary for the proper execution of the task. The lands may be turned over to the States that do this. Where the lands are not wanted by the States or where those States do not give guaranties satisfactory to the Federal Government of handling them properly, they will not be released.

When a State receives the Government land, however, it is maintained that a greatly improved situation will exist for handling it. State and Federal lands will go into one pot and can be operated as a unit. They may be controlled, restored, leased, and fenced as circumstances seem to warrant. Areas checkerboarded by railroad lands may be handled under agreements between the two parties owning them. Their interests will be identical and unit action should be natural and easy.

The State, dominating this situation, should be able to bring about the proper use of all its grazing lands. Great benefits to its citizens should come about through the restoration of this land and its proper use for the production of grass and of maximum stream flow. It will be required to prepare for this before the land will be turned over to it.

Homes Like This Follow Irrigation

This theory holds that the States are competent so to take care of these lands as to get proper returns from them. The States, being close to this problem, can adapt themselves to the varying requirements in different sections and work out individual solutions. It may be wise to put the responsibility for handling such situations on the States rather than to leave it with a distant and bureaucratic Federal Government. But if the responsibility is left with the Federal Government, adequate control laws which the department has urged for a quarter century must be provided.

Each of the Western States has an official agency to handle its lands, usually under a State land commissioner. Such agencies were necessary to handle the lands already in the possession of the States. An organization has already been developed and is functioning. It is looking after this land so inconveniently mixed with that in other ownership. The same organization would be able, with a bit of expansion, to handle the added lands. It might even develop that the added areas, together with a greater freedom in handling them, would prove proportionately much more profitable than the lands already owned by the States.

Western Lands Yield Heavy Potato Crops

Montana, for example, is already in possession of about 5,000,000 acres of land—an area about equal to that of New Jersey. It has a land commissioner and a staff that cost the State around $75,000 a year. That office collects in rental and lease money about $500,000 a year. Thus is a substantial profit shown from the State lands. There are about 7,000,000 acres of Government land, an area comparable to that of Maryland, within the borders of Montana. It is likely that an addition of $25,000 a year to the appropriation for the land commissioner would enable him to handle the added lands. It is probable that an additional $500,000 a year could be brought into the coffers of the school fund for Montana from these lands.

Newcomers in the Desert

Similar situations exist in many of the States. Colorado, for example, in the last year for which figures are available received $642,000 in rentals for the surface rights of the

3,700,000 acres of State lands that have been turned over to her. She might get a comparable profit if she were to come into possession of 8,000,000 acres of Government land still within her borders. Idaho got $190,000 from the 3,000,000 acres of State lands she has received. There are 10,000,000 acres that might be added to this area. Washington got $315,000 from 2,400,000 acres and might add 1,000,000 acres to it. New Mexico got $136,000 from grazing leases for 4,400,000 acres and might add 16,000,000 acres to it. Wyoming received from grazing and sales, from her 3,500,000 acres of State lands, $548,000. She might add 16,000,000 to that acreage. Arizona got $303,000 from leasing of State lands. She has 8,000,000 acres and might double it. But profits are not the objective; watershed protection by an adequate police power is.

Sheep on the Public Domain

Many estimates are made of the degree of depletion of ranges in many parts of the West. With relation to some places it is said that their proper care would increase the number of livestock they would pasture by 50 per cent. Of other places it is said that the carrying capacity of the range might be doubled. Authorities from other important sections of the range country, and in position to know, state that the carrying capacity might be multiplied by five, by ten. It would seem to be a conservative statement to say that if the ranges were carefully handled and restored they might be brought to a condition where they would carry three times as much livestock as they do.

Thus we have the situation set-up. The proper handling of range land would make it possible for livestock growers to produce three times as many beefsteaks and lamb chops on it as they do at present. While this land is in this way adding to the meat supply and the wealth of the Nation, it would also be serving an indirect purpose that would be yet more important. It would be maintaining a ground covering that would prevent erosion and conserve the stream flow of the dry country, where water is the controlling element, upon which all else depends.

The final survey of this remnant of the public domain and its assignments to its proper owners has been one of those tasks of government that has dragged on and on through the decades. Federal legislation has been inadequate. The General Land Office has had small authority to protect Federal lands. Obviously this land situation should be taken hold of with vigor and cleaned up, whether or not the public lands go to the States.

When the proposal to turn surface rights over to the States was made, there were those who took the position that they should have the mineral rights as well. The new theory of conservation does not go this far. It takes the position that practically all the net returns from lands leased on a royalty basis for the production of coal, oil, or other minerals already go to the Western States. Under the law the Federal Government takes 10 per cent of the returns from such leases to cover the expense of operation. The State in which the minerals were produced gets 37½ per cent. This leaves 52½ per cent, all of which goes into the reclamation fund and all of which is spent in these same Western States. Since the Western States at present get all the money from minerals, there would seem to be no great possibility of increasing their return under their own management. The conservation of mineral resources has aspects that are national and often call for a consideration from a viewpoint that is different from that of individual States. For the present, at least, it is considered advisable that the Federal Government should retain the subsurface rights of these western lands.

CHAPTER IV

OIL CONSERVATION

THE gently folded Cretaceous and Tertiary formations that border the Gulf of Mexico and the Caribbean and that recur on the California coast form the most satisfactory inverted bowls in all the world for the capture of that oil and gas which nature through the ages has brewed from the remains of marine organisms and released far beneath the earth's surface. That oil and gas, in seeking to escape, has been forced up into these bowls and other gas-tight traps and held against the coming of tools that man puts on the ends of strings of pipe a mile long and sends down to puncture their upturned bottoms.

Four-fifths of the oil produced in the world to-day is coming from those regions of the western continents. In the Eastern Hemisphere there is another area of folded sedimentary rock, extending from the Indian Ocean north toward Russia. It offers to the world the fields of Persia, Iraq, and Russia. In mountainous Europe and much of America the layers of rock are too broken to provide satisfactory oil traps or are not oil bearing because of the nature of the rock. Africa and other extensive areas are composed chiefly of formations of ancient igneous rock that yields no oil. Australia and Brazil have not been well explored but are not geographically promising. Thus is a rough view of the world given that may give some basis for oil expectancy.

It is estimated that perhaps one-fifth of the oil of the world lies beneath the surface of continental United States. That territory has been more thoroughly explored than any other. To-day it is producing the lion's share—some 65 per cent—of the oil used by man. It is producing this oil from a reserve of 20 per cent of all the oil there is.

Signal Hill, Long Beach, Calif., a Typical American Field

There is no escaping the fact that if this procedure continues the United States, now so well supplied, will be among the first of the oil-producing nations to be permanently without that utility. When these facts are understood those officials of Government on whom responsibility falls for the conservation of those raw materials with which they have to do are likely to become somewhat perturbed. Responsibility for guidance in this problem rests largely with the Department of the Interior.

There is general agreement that the United States has developed and produced its oil too rapidly. With the

A Texas Gusher Comes In Like This

translation of the iron age into the oil age, the scramble has been without precedent. For ten years now, despite the increasing multiplicity of its uses, oil has been found faster than it could be consumed. All the time there has been more of it above ground than the market demanded. If during the month of June, 1931, all the wells that were down to oil had been produced to capacity they would have yielded enough of this liquid mineral to last a year.

The presence of too much of any commodity leads inevitably to its waste, and so has it been with oil. The record of all time for the waste of a national resource has been broken in the past decade in the oil fields of the United States.

In California, for example, it is estimated that the loss of natural gas alone has been sufficient to have paid the national debt. Every day for years in that State enough gas has been going off unused into the air to do the work of 25,000 tons of coal. The same sort of gas losses has taken place in Oklahoma, and notably in Texas. And these losses still go on. New fields have been brought in when there was already too much oil above ground. They have been produced when they were not needed. They have depressed the market and hurt the industry. They have been depleted without serving any useful purpose.

The oil industry, in fact, has been at sixes and sevens. It has been chaotic and disorganized. It has been a scramble, a madness. Most of those in it have admitted this. It has not been their fault, and their conduct under the circumstances has been logical and normal. There has been no time to stop, to estimate the situation, to map out a proper course of action.

There is that in the business of producing oil which naturally leads to waste. The procedure has repeated itself scores of times and, though it smacked of madness, it has, until recently, seemed unavoidable. Here is the way it works:

The Waste Is Great When a New Well Spills Oil About It Like This

Some wildcatter, pecking away with his drill in your neighborhood or mine, strikes oil. Geological examination or actual drilling shows that there is a dome here that is 2 miles long and half a mile wide. It is a single pocket filled with porous material into which oil and gas have been packed under high pressure. Drilling anywhere in this area is likely to tap the supply. The land is owned by twenty people. The man who gets the most wells down quickest will get the most oil. Everybody begins to drill.

The development of this field of necessity becomes a race. He who goes down slowly may find the oil drained from beneath his land before he gets to it.

Experience has shown that one well on 10 acres is likely to be economically sufficient for getting the oil. Economical development would drill on this basis. Under the method of unrestrained competition, however, 10 wells may be put down on 1 acre. The expenditure for well drilling may be a hundred times as great as it should be.

Dominguez Field, Near Los Angeles, with a Well to Each Ten Acres, Is a Model of Proper Development

Many wells are brought in quickly. The dome is induced to empty itself with the greatest possible expedition. To be sure, there may be no need of the oil; there may already be overproduction in this region; there may be no arrangement for taking care of the gas that always comes off with the oil.

There is another waste that has come to be well understood that may be greater than all the others. The flow of oil from this field depends on gas pressure. When the pressure is exhausted the oil stops coming up. Of the oil that is in the pool it is believed that not more than 20 per cent is usually recovered by ordinary methods. Much of the rest of this oil—perhaps four-fifths of it—under present ordinary methods remains beyond the reach of puny man playing around at the surface.

The New Field at Venice, Calif., Is an Example of Town-Lot Development with Many Times More Wells Than Are Needed

Obviously any waste of gas hastens the time when the gas pressure will disappear. Think of the waste of a well out of control wildly blowing gas and thus wasting the only lift that can bring up the oil beneath! In the interest of prolonging the life of the field, no gas should be allowed to blow off at random or before its full quota of work has been performed. In the past few years the oil people have learned that the gas which brings up the oil may be captured, pumped back into the pool, and induced to restore the pressure. It may be induced to bring up a second and a third load of oil. Gas which can not otherwise be used obviously should be pumped back into the ground so that the life of the field may be prolonged.

Oil in Improvised Storage Often Catches Fire

The owners of a dome usually spend much more money on it than they should and receive less returns than they should. The public nearly always gets less benefit than it should because each recurring fragment of a great natural resource is given over to waste.

The sort of competition that takes place as between individuals in a single field goes on as between fields, as between productive regions, States, nations. It should not go on. There is now recognized a principle of conservation which, if applied, would result in oil fields being brought to serve a much greater purpose than they are now serving. Incidentally, they would make much more money for their owners.

The principle might have been applied to hundreds of actual fields in the United States that have been operated and have been depleted so wastefully. Under it, here is what would have been done:

Finding that they owned land over an oil dome, its possessors would have pooled their interests. They would have agreed to develop the field as a unit and split the returns in proportion to their holdings. Since the gas may inherently be as valuable as the oil, they would have found it to their interest to wait until pipe lines were laid and a market was established before allowing it to produce itself. Since the maintenance of gas pressure underground is vital to oil production, the gas that could not be sold at a fair price under efficient management would have been forced back into the ground. They would naturally have studied the oil market and would have produced when it was favorable and shut down when it was off. They would have secured the maximum recovery of both oil and gas and the maximum financial return.

CHAPTER V

KETTLEMAN HILLS

A BROKEN, barren, sun-baked ridge in California 5 miles wide and 30 miles long that the desert rats called Kettleman Hills has proven to be the richest oil field in the world and the greatest storehouse of wealth ever uncovered by man. There nature's oil tanks, a mile and a half underground, by 1931 had been tapped by two score wells and the flow, though restricted, could be started at any time as simply as one turns a spigot. When this was done a forbidding strip of waste land, shunned and despised a few brief years earlier, would produce riches faster than it ever came from all the gold mines of the world combined.

The Government, in the person of the Department of the Interior, observing this possibility, and having gravely and through a generation studied the wastes incident to competitive development of oil fields, thrust its often-mentioned and sometimes-commended long arm all the way out to California and pointed an admonishing finger at the humpbacked hills where the wealth lay and might be wisely used or wasted in accordance with the manner in which the situation was handled. The result was that Kettleman Hills will be developed differently, that the good accruing from it promises to be doubled, and that an example in oil-field conservation will be set up so spectacularly that all the world is likely to take notice.

In an attempt to measure this oil bonanza it may be compared to Cripple Creek, in Colorado, which reached the maximum of gold production in America from a single field in 1900, when it yielded up $18,000,000; or the famous Comstock lode, in Nevada, which in 1877 produced $14,000,000 worth of the yellow metal. When three wells had been brought in at Kettleman Hills that area was producing wealth faster than either of these gold fields at its maximum.

Barren Kettleman Hills Contain Oil of Immeasurable Value

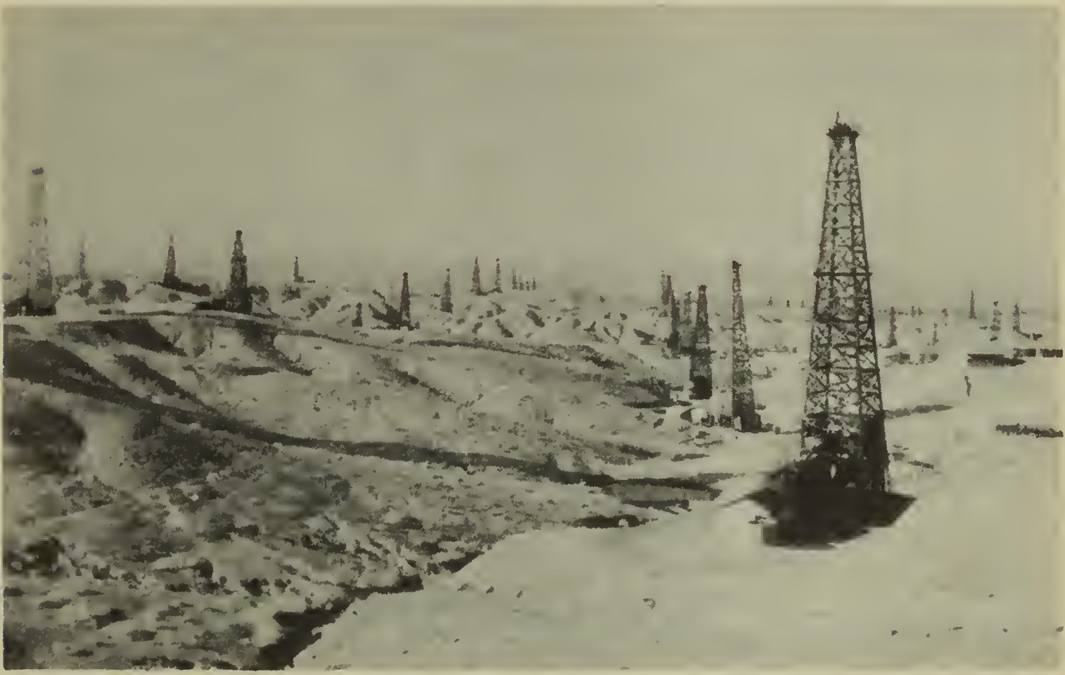
The Homestake mine, in South Dakota, which in 50 years has yielded more gold than any other such American property, produces about $4,000,000 annually. The average of the first eight wells to flow at Kettleman Hills was 1,000,000 barrels a year, which, with the incidental gas and gasoline recovered, was worth $4,000,000. Thus a single average

A New Well Out of Control

well in this wonder area was as productive of wealth as is the whole Homestake region.

Yet a single well at Kettleman is but one unit in a multitude. There is room for 1,000 such wells if but one were put down on each 20-acre tract. On this basis the field would yield wealth as fast as 1,000 Homestakes.

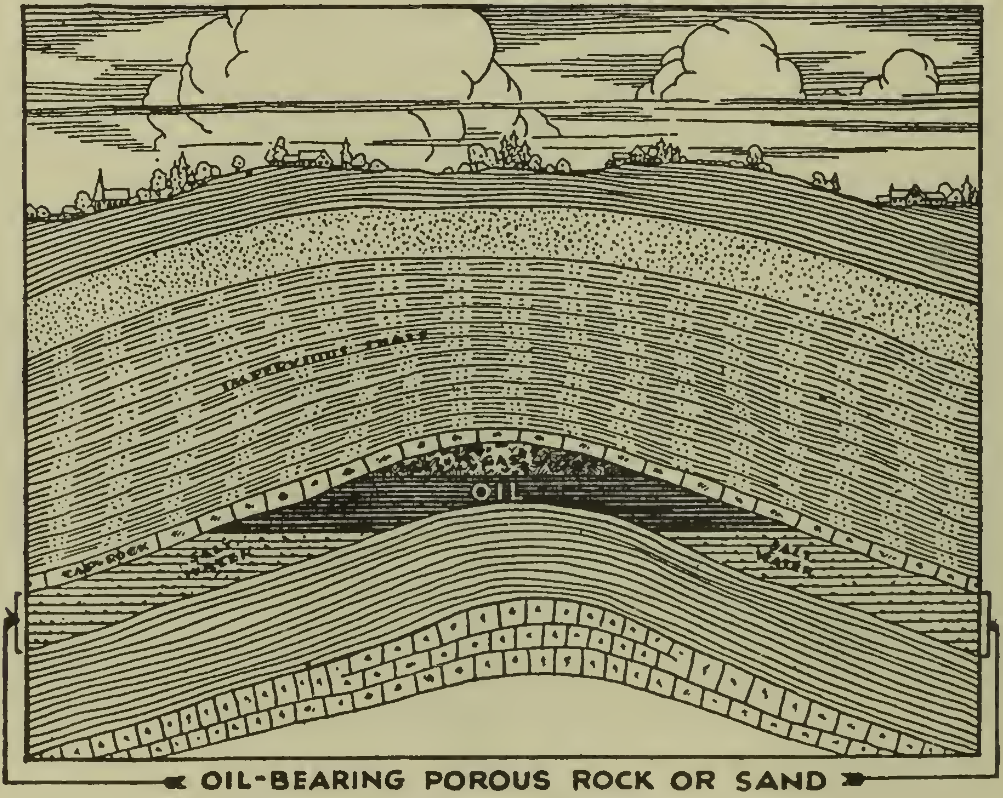
Oil wells, the skeptic may say, are short lived. The next-door neighbor of Kettleman Hills, however, is the Coalinga field, in a similar earth wrinkle, and it has been producing for 35 years. The Midway-Sunset field, 60 miles down the valley in a similar formation, has been pouring out its wealth for 20 years and is still at it. Over in the Los Angeles area are such fields as Santa Fe Springs, studded with derricks as thick as they can stand, that have been producing for years and, with a bit of exploiting for new sands from time to time, yield ever-increasing wealth.



Wells Near Taft, in the Kettleman Hills Area

Mother Earth, molten in the heart of her, shrinking as she cools, here and there has made continent-long cracks in her 10-mile-thick crust. In milder moods she has merely wrinkled it as a carpet ridges when a chair is dragged across it. Just this was done in ages past in California. A group of such wrinkles fluttered for a hundred miles along the desert, sun-parched, west fringe of San Joaquin Valley. The geologists call them anticlines. Wherever they are found, they say, it is worth while to look for oil.

An anticline is not unlike a great bathtub turned upside down. The inverted tub at Kettleman Hills is 5 miles wide and 30 miles long. Ten miles up the valley another such wrinkle accounts for the Coalinga field. An equal distance to the south is the Lost Hills area and a little farther along is the famous Elk Hills Naval Reserve and Midway-Sunset field. Deep below these inverted bathtubs Mother Earth brews oil and gas out of water bugs or other forms of life that died millions of years ago. These find their way up through the porous earth, ordinarily



Nature's Trap for Oil and Gas

reaching the surface and passing off into the air. Nearly all of the gas of the ages has long ago dissipated itself. Only these anticlines and kindred formations form traps that catch it as it tries to get away. Into them it may have crowded, always increasing its pressure upon itself, liquefying, rearing to go. Puncture the bottom of one of these topsy-turvy tubs and it hisses forth just as will the gas in a ginger-ale bottle if a tack is driven into its cap.

In Early Days in Pennsylvania Drills Were Worked by Hand and Oil Was Found At Less Than 100 Feet

Geologists may "read the rocks" from surface indications and advise as to localities in which formations indicate the presence of oil traps. Oilmen then "ask the drill" by putting down wells. The geologists long ago pointed out the various wrinkles of the western San Joaquin. Government geologists came to Kettleman Hills 25 years ago, drew geological maps, and set it down as an oil field of the future. One after another the San Joaquin wrinkles were drilled and, with the exception of Kettleman, oil was found at depths ranging from 1,000 to 4,000 feet. As it turned out, the oil at Kettleman was too deep to be reached by the drills of that day.

The history of drilling in Kettleman Hills reveals a generation's story of the increasing depth of oil wells. In 1900 half a dozen attempts were made in this area, the wells ranging in depth from 600 to 1,000 feet, without results. In 1908 a well was sunk to a depth of 1,290 feet, but remained a dry hole. In 1910 four started down and reached depths of 2,800 feet, 3,500 feet, 4,300 feet, 4,800 feet, getting only traces of gas. Standard Oil started a well in 1919 which in three years reached the unprecedented depth of 6,600 feet, got in a jam, and had to give it up. During the period 1924–1926 a number of wells were started, some of them going down 5,000 to 6,000 feet, encountering many oil and gas showings but nothing of value. The oil here was not in the horizons in which it was found in the related folds up and down the valley. If it existed at all it was at depths such as man, with all his ingenuity, had never been able to reach. But finally, in 1928, at an expense of $250,000, and at a depth of 7,200 feet, the discovery well was brought in.

This deep drilling for oil is one of the mechanical marvels of the age. Conceive of the drill at the tip of a string of pipe, boring its own way down through the various rock layers of the earth, refusing to be stopped by flint-hard layers hundreds of feet thick or diverted when glancing blows strike the sloping side of huge bowlders.

Natives in Burma Dig Open Wells and Produce Their Own Oil

Conceive this little tool at the end of a string of this pipe, half a mile, a mile, a mile and a half long, feeling its way, meeting emergencies, leaving behind it a pipe channel that will remain in place and carry without leakage a roaring and high pressure torrent if the exploration turns out successfully.

Eight wells at Kettleman Hills were in production two years after the first discovery well came in. They were bringing to the surface more oil and gas than the market warranted. The gas in particular was being blown off into the air. The 80 billion cubic feet of gas blown into the air at Kettleman in 1929 from half a dozen wells represented twice the power that will be generated at Hoover Dam in a similar period when that greatest of power plants is completed. Four million dollars a year in gas were being blown into the air at Kettleman from the few wells in production. Twenty-eight more wells had been driven to the top of the oil sand and

A Well in the Back Yard Which Yields a Few Barrels a Day for Half a Century Is Common in Ohio were being held in readiness for production at any moment. Hundreds more could have been started on a few weeks' notice. There was already more oil above ground than the market demanded. There was no use whatever for additional gas. Oil and gas might here be turned on as though at a spigot that would paralyze the industry for the whole West. Each new well would have added to the chaos of overproduction and waste. An emergency existed.

Santa Fe Springs Oil Field, Near Los Angeles, Has Wasted Enough Gas to Supply That City for Decades

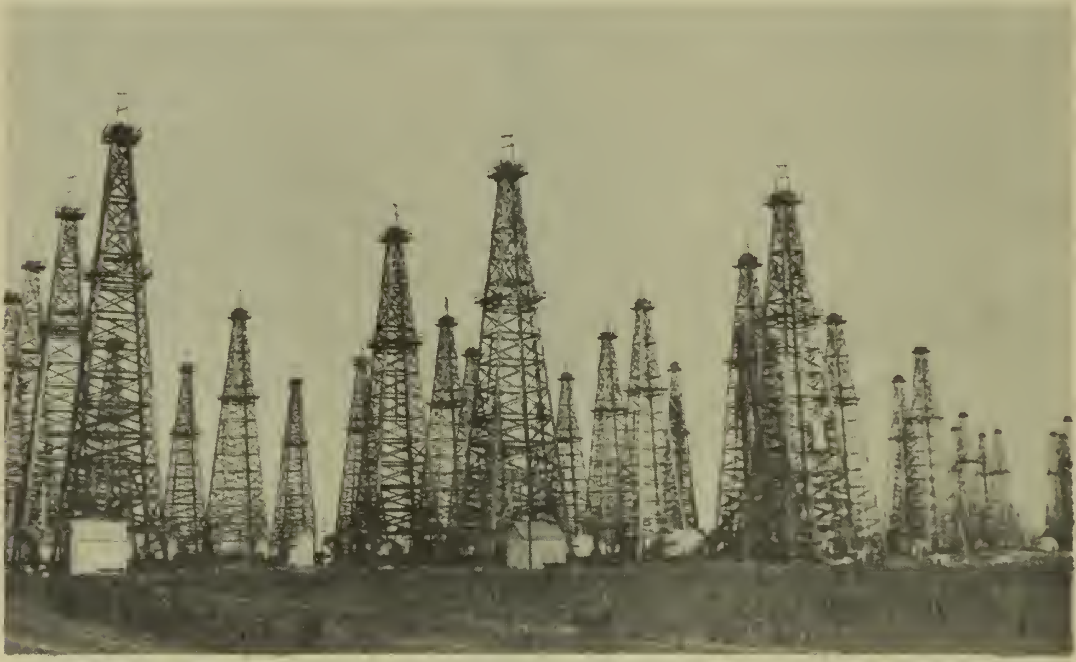
The Department of the Interior had seen this situation developing. Considerable responsibility rested on it, for the public domain was in its care and almost half the land here was Government owned. The oil and gas under the privately owned land, as a matter of fact, was a natural resource deserving to be conserved. It was just as foolish to throw away a billion dollars' worth of natural gas, tucked snugly away in this underground tank, as it would be to throw away a billion dollars' worth of sugar in a warehouse.

Yet other oil fields had been wasting similar billions all the time. The set-up of oil-field development was such that it led to a preventable waste of half the wealth discovered. We had been going along through these mad oil decades getting one dollar out of these fields where we might have had two.

This oil field could be allowed to develop helter-skelter or it could be considered as a whole and developed as a unit. Under this latter plan the oil would not be produced until the market was right. It would not be produced until a market be found for the gas. Kettleman Hills, operated on this basis, should produce twice its ultimate return on the old method. The difference was worth saving. Under such operation the established oil structure would escape the wasteful production. A spectacular precedent might be established that would be followed elsewhere.

The organization of the property holders in Kettleman Hills was attempted. Far-seeing companies operating there, with the department's cooperation, undertook the task. The Government owned nearly half the land but had leased it for development. Almost half been given in land grants to the Southern Pacific Railroad, which had held it for 50 years and, just before this discovery, had sold it to the Standard Oil of California. The Government could exert certain pressure on its lessees. Standard saw the advantages in deliberate production. But fragments of Government land and railroad land had gone into private ownership. These

Under Titanic Pressure These Wells of the Barren Hills Often Get Out of Control individuals were likely to want to tap their wealth right away. They may have been waiting for 30 years and wanted a taste of wealth before they died. Yet if they drilled any scheme of conservation would be upset, for everybody else would have to do the same. The task was to bring all into agreement.



The Ghost of Great Spindle Top, in Texas, Which Died More Than 25 Years Ago

Negotiations went on for a year and a half. Innumerable obstacles were overcome. Special permissive legislation was put through Congress. A State law prohibiting the production of oil until the gas coming up with it can be used had gone into effect in California. The oil industry added its favorable pressure to that of State and Nation. Dissenters who had insisted on wrecking the scheme were dissuaded. Certain land and lease holders about the fringe of the field remained obdurate, insisted on independent production, and caused the results to be less than complete. Quite comprehensive agreements, however, finally were signed. Thus unit operation sufficiently complete to furnish an impressive object lesson was brought about.

The result will be a systematic, economical, and unhurried development of the heart of the field that its entire wealth may be conserved and ultimately used. Oil and gas will be produced in the unified area only as it is needed. Gas sufficient to supply California for two generations will be saved instead of escaping into the air. The oil and gas market will remain undisturbed from this source. The field will produce in the long run twice the wealth that it would under competitive development. The different areas will be operated by corporations established for the purpose. The proceeds will be divided among those interested in proportion to their holdings in acres. A model plan for oil-field operation and conservation will be presented to all the world in a way so striking that it can not escape notice. The result may be the development of a method that will greatly increase the span of years during which those most convenient of fuels, oil and gas, may be available to multitudes of people all around the world. The engineers and company executives who have brought this result about by voluntary action are pioneers in a new era of cooperation. Compare their achievement with the demoralization forced on the industry by the unrestrained flood of oil from the east Texas field, finally controlled only by martial law.

CHAPTER VI

NATURAL-GAS CONSERVATION

NOWHERE is there a more striking example of a natural resource which but yesterday was going prodigally to waste but which to-day is making seven-league-boot strides toward being carefully conserved than is presented by natural gas. To be sure natural gas had known its day of glory in certain restricted areas, but in its abundant appearance in connection with the production of oil in the large fields of the West the waste of it had become notorious. Now, with the aid that has been lent it by steel, fabricated in a new way and welded into unbroken hundred-mile links of pipe, natural gas has assumed a value that is leading to its being held in nature's tanks until it can find this new route to market, or its actual delivery to that market.

Wild gas brought from underground in isolated solitudes is traveling a thousand miles to centers where millions every day touch matches to burners because of the fact that the steel industry developed pipe 2 feet across and a method of so welding it together that it would stand high pressure and never leak.

With such pipe Louisiana has shaken hands by means of natural gas lines with Atlanta and St. Louis; Kettleman Hills, in California, has blessed San Francisco; and Amarillo, Tex., has reached out for Chicago and Minneapolis. Single projects are being undertaken that will cost a hundred million dollars, and enthusiasts are talking of the time when all the Nation will tie into a system with stopcocks to the nether regions.

The prospect of selling this natural gas has given a value to it that has caused wells to be capped in a thousand places that heretofore have been allowed to run wild and exhaust themselves. A value has been given to a latent natural resource, heretofore profligately wasted, that, through the operation of economic law, will lead to its careful conservation.

Dynamic Pittsburgh, as well as the region thereabouts, has known natural gas for a long time and owes much of its industrial and commercial advancement to it. This region also has demonstrated that by scratching around a bit a flow of gas may be maintained decade after decade. Industrial gas in the Eastern States is an old story, but the promise of utilization that now presents itself is new.

The maddest adventure of the present generation has been the pursuit of oil. Men have gone about the land dropping drills to puncture its crust on the chance of finding oil and gas that have been brewed and stored in ages past. Often they have found them. Other men have unlocked the secrets of usefulness that lay within this oil, and it has lighted the lamps of the farmhouse, greased the wheels of industry, and exploded itself in cylinders to the acceleration of transportation.

Always it has been natural gas, absorbed in this oil under pressure, that has pushed it up where man could capture it in his barrels. Often little further use has been found for this gas when it has served its initial purpose of oil delivery. Immeasurable quantities of it have come to the surface where there was no demand for it, have been liberated, and, thanks to the law of the diffusion of gasses, have spread themselves out so thinly as to lose their identity.

The Sinuous Steel Snake Stretches Itself Across the Plain

Now that a use for this gas is being found it may well turn out that the value of that which got away was as great as the value of the oil that was recovered. In California, Texas, Oklahoma, and Louisiana some of this incidental gas has been used, but most of it has gone to waste. Recently a new era has dawned and is but now crystallizing into an organization that will save the gas of a nation and distribute it for the benefit of the people.

In California the gas of many oil fields has for decades brought marketable fluid to the surface, served as a power-producing fuel for industry, and supplied adjacent communities with industrial and domestic natural gas. When

Sturdy Men in Asbestos Suits Fight Wild Wells That Catch Fire this was done there were still vast amounts of natural gas left. The practice has been to let it blow off into the air. It has been thrown away as a thing of no value.

The State tried for years to curtail this waste, but it kept on being a fact that a billion cubic feet of gas was being used every day in California and another billion feet was being wasted. If this condition continued, obviously the natural-gas supply would last but half as long as it would if the supplies were conserved. In the Kettleman Hills oil field the discovery well blew gas out of control for six months. The western record was broken when a pipe line 250 miles long was laid to San Francisco. This one well produced enough gas to supply the northern half of California. It could supply all the gas that is locally needed. Other wells have been brought in at Kettleman and much of their gas has been wasted. Yet, despite a lack of a developed market, it was not long before the gas produced at Kettleman Hills was bringing a greater return than the oil. Soon California was planning pipe lines in many directions, notably toward Portland and Seattle, far up the coast. She has more gas than she can use at the moment, but, in the light of demonstrated possibilities, she wants to bottle it up and wait to see what to-morrow will have to offer.

This yield of natural gas as an incident to oil production is not, however, the big item in the new scheme. To be sure, 300 towns and cities in Oklahoma are so supplied, but that fact is by no means as spectacular as what is happening in the Monroe and Richland section of Louisiana, or in the Panhandle of Texas, where fields have been discovered promising unbelievable quantities of gas but yielding little or no oil.

Natural gas was discovered at Monroe, in northern Louisiana, in 1909. So little value was attached to it that it was not until 1916 that any of it was put to work. There is an industry—that of the production of carbon black, used in the preparation of printer's ink and in the treatment of rubber that it may make tougher automobile tires—that is based upon the presence of abundant natural gas at a very low price. The carbon-black people had operated in the West Virginia field, but now they saw Louisiana beckoning.

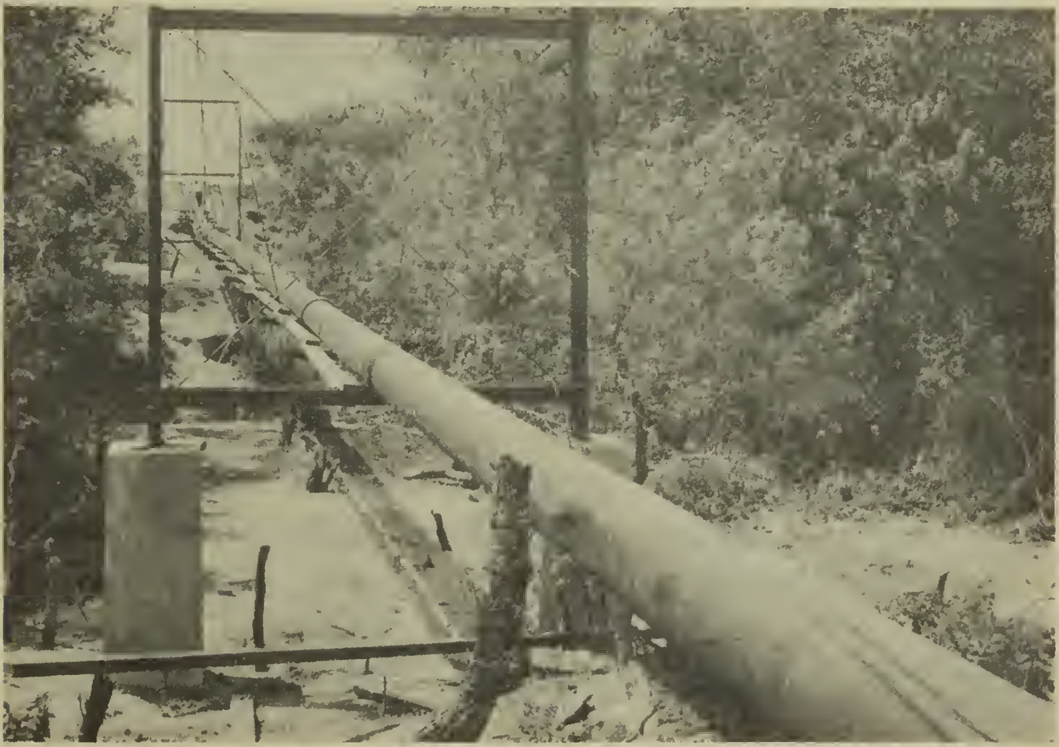
A New Sort of "Railroad" Finds Its Way Cross Country

Carbon black is the material that forms on the lamp chimney when the wick smokes. It is formed by natural gas when that fuel is burned in the presence of less oxygen than is needed for complete combustion and the flame is directed against plates on which it may be deposited. But it can not be economically produced when it must pay industrial prices for its gas. The first decade in the life of the Monroe natural-gas field was devoted to the production of carbon black.

Then the idea of piping this gas to distant municipalities and using it commercially began to develop. A pipe line originating in the Monroe district felt its way down the river to Baton Rouge, grew ambitious, and thrust on to New Orleans. Another meandered up through Arkansas to Fort Smith. Hearing the more strident call of the great city of St. Louis, 450 miles away, the Monroe field struck out boldly and spanned that unprecedented distance. Houston, Tex., young industrial giant, attracted another tentacle. Finally a line was thrust out ambitiously through swamp and morass, across the State of Mississippi, supplying Meridian and West Point, on through Birmingham, Ala., to Atlanta, in Georgia, 240 miles away, distributing the ashless fuel all along the route.

A neglected natural resource in a nonindustrial area had built an empire for itself and contentedly had sat down to collect its continuing tribute. Carbon black moved on to Texas, where fuel still was to be had for next to nothing.

Amarillo, Tex., was a straggling cow town that sat out in the midst of those lonesome reaches of the semiarid Great Plains area that stretched from Mexico to Canada. Inquisitive geologists, financed by speculative oilmen, began looking for evidences of domes and anticlines in this lonesome area in the second decade of the present century, and in 1918 gas had been tapped that pushed 450 pounds against every square inch in its eagerness to escape its age-old confinement. Time and perseverance developed the fact that, beginning at the Oklahoma border and stretching westward, there was a 90-mile-long uplift that through the ages had been putting away gas much as it is stored in those red-painted circular tanks that infest most communities. About the fringes of this area oil was produced, but it was primarily a natural-gas belt.



A Link in the New Thousand-Mile-Long Pipe Line

Amarillo was so far from any area of large population that its gas was considered next to worthless. There were no optimists so sanguine as to surmise that a time would come when its British thermal units would ever stimulate industry in distant cities. Cheap fuel, some said, might eventually bring fuel-using industries to the Panhandle, but beyond that possibility there were no prospects. Cheap gas did, in fact, entice the carbon-black industry onto the prairies. As Monroe, La., found a more profitable use for its gas, long rows of houses given to the burning of carbon black lined these western railroads and precipitated their carloads of soot.

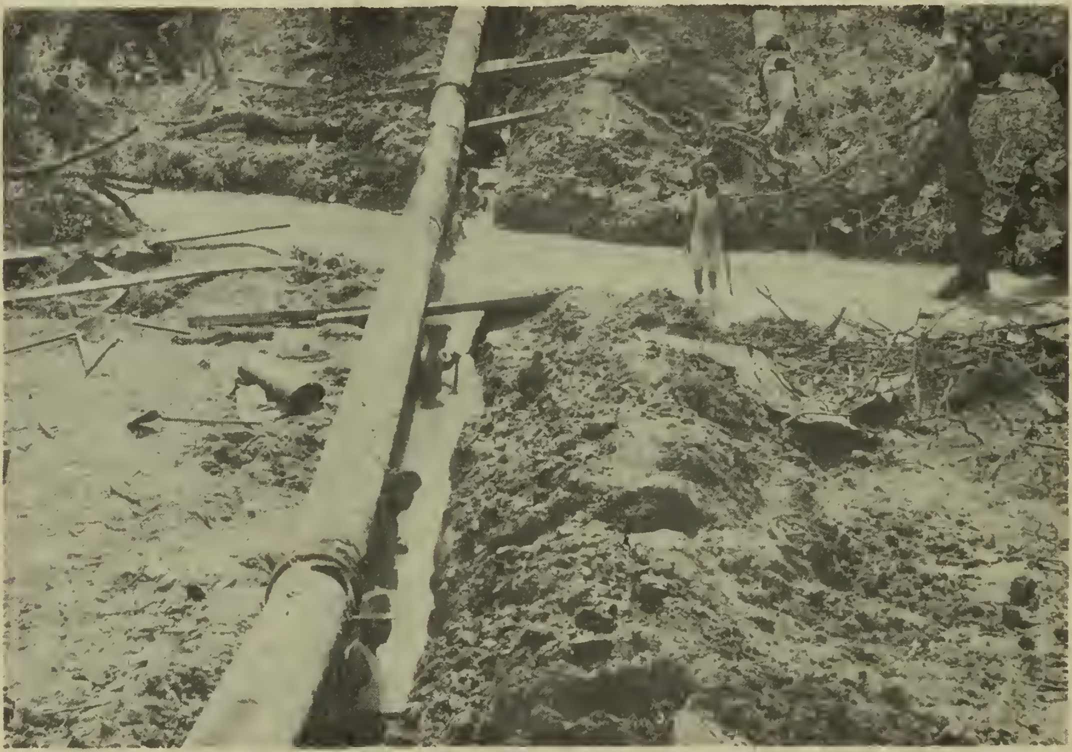
The Joints Are Welded Together in the Field

In September, 1928, a pipe line 20 inches in diameter and 382 miles long, capable of delivering 250,000,000 cubic feet of gas a day, reached Kansas City from the Panhandle. At the same time a line to Denver 340 miles in length and 22 inches in diameter was under construction. It later branched out to supply such adjacent cities as Boulder. Then the Panhandle thought about Milwaukee and set about its annexation. Finally there came what seemed the climax of hallucinations due to gas, giving the impression that certain important people, reputed to be solid business men, were under its influence. Two lines, 24 inches in diameter, 1,000 miles long, struck out from the Panhandle to the Chicago area. The undertaking would require somewhere around $100,000,000 in the execution, yet there seemed to be no worry about money, for one of the greatest of the public-utility corporations sat in at the christening.

But for the advances made in steel-pipe manufacture this whole development would have been unlikely. These manufacturers took steel sheets, rolled them into tubes, welded the edges together, and had tubes of strong, enduring pipe. They took them into the field in 40-foot joints, welded the ends of these together and converted them into air-tight serpents hundreds of miles long, crawling across the landscape, capable of enduring high pressure, and delivering their cargoes in far-away cities. Such pipe is a child of yesterday. To-morrow it may be carrying natural gas to the mass of the population of the United States.

So rapid has been this development of the use of natural gas that few people seem to have paused to consider its ultimate possibilities. It seems obvious, however, that the heart of the Nation which lies between the Appalachians and the Rockies and boasts a population of 57,000,000 will, in another year, have natural gas available to it. The possibilities of reaching the rest of the world with the California surplus, or of reaching the New York area with gas from Louisiana-Texas resources, is to-day no more vague and seemingly impracticable than reaching Chicago seemed a few years ago. If one should predict that natural gas will be available in 10 years to all of the United States that has any urgent use for it, there would seem no reason for doubting his sanity.

There is a question of governmental and public interest in which oil has been climbing into the position of a front-rank industry of the Nation the waste of gas has appalled the conservationists. The gas came up with the oil, and often, after the gasoline was squeezed out of it, there was no further use to which it could be put. Generally it has been turned into the atmosphere. The waste has been beyond measuring. The Federal Government has constantly preached of natural-gas conservation. Some of the States have sought to prevent its waste by regulation. Now the law of profit comes to their aid. It is shown that gas, if kept below ground, may be sold at substantial prices. Thus economics, coming to the aid of government, aids in saving a great natural resource.



Welded Steel Pipe Finds a Bed in Swampy Places

CHAPTER VII

THE STATES ACT FOR OIL CONSERVATION

IN APRIL, 1931, a group of oilmen styling itself the Oil States Advisory Committee, composed of representatives of the governors of 10 oil-producing States, appeared at its own request before the Federal Oil Conservation Board in Washington. This board was created by President Coolidge to study oil problems and is composed of four Cabinet members—the Secretaries of War, Navy, Interior, and Commerce. In asking for a hearing before the board the committee stated that its purpose was that of "developing plans under which we may stabilize the industry." It had passed resolutions looking to that end at a previous conference held in Texarkana, Tex.

The committee called attention to the necessity for the elimination of waste of an irreplaceable resource, to prevention of the threatened forced abandonment of hundreds of thousands of small wells throughout the oil-producing areas of the United States, to preservation of the independent oil-producing areas of the United States, to preservation of the independent oil operator as a competitive force, thereby avoiding the creation of monopoly, and to the prevention of loss of many millions of dollars in tax revenues to the various States and to the Nation. It cited the fact that no individual oil-producing State, by its own laws, can adequately protect the national interest

The Often-Recurring Wild Well

against such conditions of overproduction, attendant waste, and resultant demoralization of a great industry, as now exists, unless the conservation efforts of the large producing States shall be coordinated. Unless there is curtailment, it argued, efforts within one State may at any time be automatically offset and nullified by increased flush production in the fields of another State, to the great damage of the areas of old and settled production throughout the country. Through bitter experience, it stated, the various oil-producing States have been forced to the realization that the conservation authorities of each State must give due consideration to the general situation in the oil industry throughout the United States. With such consideration duly given, it said the stabilization of the production of crude oil within any State is purely a problem for solution by that State and the industry therein, with such cooperation and advice as may be rendered by interstate advisory committees and with such aid and assistance as the Federal Government may be able to give.

The committee had definite proposals to submit. They came at a fortunate time. There had long been overproduction in the oil business. So much oil had been produced that prices had steadily declined—had decreased from around $2 a barrel two years before to prices below 50 cents a barrel. Discoveries and developments had come so fast that at that time there was a potential daily production several times as great as the demand. Uncontrolled production had meant great damage to the industry and inconceivable waste. Oil had become a national problem because of its universal use, yet it was produced in but 19 States. Of these 19 the lion's share came from three States. In 1930 Texas had produced 32 per cent of the oil of the Nation. The oil produced in Texas alone equaled that produced in all the world

Some Wells That Spill Over Into the Ocean Are on Government Land combined outside of the United States. Oklahoma produced 24 per cent of the Nation's oil and California 25 per cent. Thus three States yielded over 80 per cent. Add to these three, four more States—Kansas, Arkansas, Louisiana, and Wyoming—and we have seven States producing 97 per cent of the oil. All of these and three additional States—New Mexico, Ohio, and Colorado—were in the group represented on the Oil States Advisory Committee. Thus they represented the State governments of practically the entire oil-producing area.

The proposal of primary importance on the part of the committee was one that "the legislature of each oil-producing State be requested as rapidly as possible to authorize negotiation of an interstate agreement for coordination of conservation measures, any such agreement being subject to ratification by the States."

The Federal Oil Conservation Board gave this recommendation its general approval.

Carrying out this program meant the drafting of a 10-State compact calling for cooperative action in control of flow from oil wells and for uniform legislation against waste of gas and overdrilling. State compacts are by no means new. Over 50 of them have been authorized for one purpose or another, that of the Colorado Basin States, which preceded the erection of Hoover Dam and the storage of the Colorado's flood waters, having attracted most attention.

Representatives of the oil-producing States, under this program, were to draft an interstate compact providing for methods of determining requirements and allocation of production and to meet the various problems in which the States have mutual concern. When agreed upon the compact should be submitted to the various State legislatures for their approval and finally to the United States Congress. When these approvals had been secured it would be ready to function. The chief job of agencies which it created would be to find out, year by year, how much oil would be needed and to see that there is fair play among the States. It might be found, for example, that 1,000,000,000 barrels were needed for 1933; that billion barrels would be distributed among the States on the basis of the best engineering and economic information available.

Oil Stored Above Ground Constitutes a Fire Menace

A second recommendation of the Oil States Advisory Committee that was approved by the Federal Oil Conservation Board was one to the effect that "the Federal Oil

Conservation Board continue its voluntary committee on economics, to make periodic examinations into the status of the oil industry and formulate national and regional forecasts of supply and demand, and that such forecasts be given due consideration by the interstate committee and recommended, with any necessary modifications, to the respective State conservation bodies."

The Small Well That Produces Through the Years Under the Pump

Such voluntary committees had been estimating requirements in this way from time to time and had shown the practicability of such estimates. Whether or not this voluntary committee continued to serve this purpose or some other agency was created to make these requirement estimates rested with the framers of the interstate compact. This estimate, however, was the foundation of subsequent procedure and therefore an important step in the whole program.

The manner in which this voluntary committee on economics of the Federal Oil Conservation Board worked may be illustrated by the way it estimated requirements for the six months beginning April 1 and ending September 30, 1931. This committee, after weighing every obtainable element that entered into the situation, concluded that "the domestic demand for gasoline will exceed that of the preceding year during June, July, and August, and that April, May, and September domestic demand will not equal the 1930 levels. * * * Domestic demand during the 1931 period is estimated by the committee at 228,800,000 barrels, an increase of 1.5 per cent over the domestic demand of 219,589,000 barrels during the same period of the preceding year. * * * The committee estimates that gasoline exports from the United States

The Magnitude of the Oil Business Is Indicated by the Device at the Left That Automatically Loads Two Trains of Cars at the Same Time during the period under consideration will total 29,200,000 barrels, a reduction of approximately 5,300,000 barrels from the comparable 1930 total of 34,519,000 barrels. The summation of domestic and foreign requirements indicates that the American oil industry, during the period under consideration, should not anticipate a total motor-fuel demand in excess of 252,000,000 barrels, a decline of 0.8 per cent from the comparable 1930 figure of 254,108,000 barrels."

Weighing the various probable demands the committee concluded that the Nation would need to produce from its wells in that six months 461,434,000 barrels of crude oil. If equitably distributed, the committee said that oil could be produced as follows: Texas, 162,641,000 barrels, or 35.25 per cent; Oklahoma, 113,340,000 barrels, or 24.56 per cent; California, 96,624,000 barrels, or 20.94 per cent; all others, 88,829,000 barrels, or 19.25 per cent. Thus it would seem that a voluntary committee was giving a practical example of what was later to be required of an official committee.

When, under this plan, necessary production had been determined and when that production had been allotted among the States there would remain the final not-over-easy task of administering production within the several States. If a State was capable of producing ten times as much oil as was allocated to it, the demand for shares in that production on the part of the different owners of oil fields and oil wells would, of necessity, be intense. Allocating that production among the oil people would logically and naturally fall to the lot of State utility commissions.

A third recommendation that the Oil States Advisory Committee made had in mind a makeshift for influencing the problem of oil production and allocation pending the necessary steps in establishing an authoritative and permanent agency. It said that "pending the working out of such a compact, an advisory committee, representing the several oil-producing States, should continue to function as a liaison and fact-finding body, to present to the conservation authorities of the various States, at such times as may be deemed necessary, recommendations for more effective cooperation as between the States." This contemplated the continuance until other machinery could be established of the already existing Oil States Advisory Committee.

Tankers Are Important to Foreign Trade

Yet another respect in which the Oil States Advisory Committee was in entire accord with Federal authorities was in recommendation that, under organized control of production, all new fields should be developed on the unit-operation plan following the scheme worked out, largely through Government influence, at the Kettleman Hills field in California, but privately applied also elsewhere. This unit plan for developing and producing oil fields had long been a favorite theme of the oil conservationists, and its application to new fields would mean much to the oil industry. As a matter of fact, the limitation of production by the States tended toward unit operation and therefore would exercise a tremendous influence toward the avoidance of waste.

Sensational Signal Hill, Near Los Angeles, Where Wells Are Producing at a Depth of 9,000 Feet

Each of these steps presented problems that were vital, dynamic, and almost without precedent of comparable magnitude. The problems involved were more closely akin to those handled by public-utility commissions than any other agencies of government, although the oil-production business was not a public utility and there was no intent in the Advisory Committee's plans to make it one. Since an organization was to be set up for cooperative action that was the creature of 10 States it was assumed that efforts would be made to bring about uniformity of action among those States.

The steps that had previously been taken by individual States looking to a control of oil production had been quite without any degree of uniformity. In California, for example, the State exercised pressure under a law which aimed at the conservation of gas, administered by a director of natural resources and a supervisor. In Texas the regulation of production fell under the railroad commission. In Oklahoma regulation found its basis in a 16-year-old law which created an oil and gas department of the corporation commission.

The sum total of result in this situation aimed at was that the States should exert their authority to regulate oil production, that they should themselves be responsible for holding production down to the point which would prevent waste, and that working out this detail of control logically would lead toward unit operation and practical conservation. Arrival at that conclusion and preparation for making it a reality seemed to be the most direct approach that had been made to a solution of the dominant oil problem. Again the Federal Oil Conservation Board gave its approval.

And in September, 1931, the proposed compact was actually, if informally, receiving a test. The Corporation Commission of Oklahoma, the Railroad Commission of Texas, and the Public Service Commission of Kansas met with the Oil States Advisory Committee at Oklahoma

City on September 11. It agreed on an allocation of midcontinent production closely following the demand forecast by the Federal Oil Conservation Board's economic committee. That allocation was 902,000 barrels daily for Texas, 546,000 for Oklahoma, 110,000 for Kansas. An informal one-page agreement to these allocations was signed by representatives of the three States and their commissions, and California, Wyoming, New Mexico, and Colorado signified their adherence. Thus for the first time in the history of the industry was coordination between production in the States brought about.

Much of this could be traced back to a date in 1929, when the Hoover administration had been in office but a few weeks. Producers of oil assembled in convention in Houston, Tex., passed resolutions which proposed that oil production for 1929 be limited by them to that of 1928. They came to Washington and asked the approval of the Federal Oil Conservation Board to this plan for action by the industry to limit production. That board asked the Attorney General if it had the authority to grant such an approval. The Attorney General said that the board had no such powers and that the request would not have been made had those making it not realized that "under existing laws such an agreement could not safely be made without the sanction of some official of the United States. * * *" The producers' way out was thus blocked. It was at this time that the Federal Oil Conservation Board suggested that the proper approach to limitation lay through State action.

In June of the same year a conference on oil production was held in Colorado Springs and the Government's position was expressed in a statement which said that "the oil industry faces a difficult and complicated situation which can only be met by a spirit of cooperation. Primarily, the responsibility for the handling of this oil problem lies with the industry and with the governments of the States. The position of the Federal Government is not to interfere with the rights and duties of the local State governments but to lend such aid as it can and to participate in the solution of the problems. This administration has no desire to concentrate the forces of government in Washington. It has every desire to cooperate with the States. The aims sought are uniformity of the conservation legislation and the uniformity of enforcement by some body, such as a joint commission. This could be created by a simple compact of the States ratified by Congress."

The industry was not at that time ready to come to this view of the problem. The possibilities that lay in action by the States were not then generally appreciated. When two years had passed, however, State action was admittedly the proper course in solving the problems of oil production, and strenuous action was being taken at many points. Great credit is due the various State officials in undertaking this difficult but essential experiment.

CHAPTER VIII

NATIONAL PARKS

WITH twenty-two national parks and thirty-four national monuments, variously distributed in regions where wilderness conditions are preserved, or where nature exhibits her strangest and most spectacular moods, or where the attraction arises from scientific or historic interest, this Nation may consider that it has made satisfactory progress toward the conservation of such areas for the generations that are to come. No other nation of the world has such a collection of park areas.

The idea out of which the National Park Service has grown originated in the wonders of the region now known as Yellowstone National Park. Its earliest white visitors, of whom probably the first was John Colter, a hunter of the Lewis and Clark expedition to the Pacific coast, told amazing tales of its wonders. Colter made a lone trip through the eastern portion of the present park in 1807, following his return from the Lewis and Clark trip, and upon his return to St. Louis some four years later his tales were received with derision and the region of the Yellowstone came to be alluded to as "Colter's Hell."

Some years later, probably in 1830 or earlier, James Bridger, the celebrated trapper and hunter, visited the mysterious regions of the Yellowstone several times. His stories of the geysers, hot springs, and other phenomena seemed so fantastic that the newspapers of the frontier

President Hoover Caught a String in Yellowstone Lake refused to print them for fear of ridicule, and he gained a reputation of being the arch prevaricator of his time. This so aroused his ire that he began to live up to his reputation by greatly exaggerating the already unbelievable truth. His stories to-day are classics of the frontier.

In 1870 a party of prominent citizens of Montana, under the leadership of General Washburn, surveyor general of Montana at the time, wrote history. For it was at one of the last camp fires of this Washburn-Langford expedition that the suggestion made by Cornelius Hedges, Montana lawyer, that the party work for the establishment of a great national park to preserve all the natural wonders of the region was adopted. The following year the Government sent an official exploring party into the region, and in 1872 Congress passed the law establishing the park.

Though the Yellowstone is officially the oldest of the national parks, the Hot Springs region in Arkansas was reserved in 1832 "for the future disposal of the United States." Active supervision of the area under the Department of the Interior, that the benefits of its hot waters might be available for all, was undertaken in 1877. In 1921 the area was proclaimed the Hot Springs National Park.

In 1890 three new national parks were created, all in California. These were Yosemite, with its gem valley, buttressed by huge headlands, veiled in waterfalls and surrounded by mountain wilds; Sequoia, home of the big trees and locale of Mount Whitney, highest mountain in the United States outside of Alaska, and the General Grant National Park, whose biggest tree measured 40 feet across and 266 feet tall, one of the most magnificent specimens of plant life in all the world. The year 1899 saw the creation of Mount Rainier National Park, in the State of Washington, hung with glaciers and studded with Alpine flowers. Then in 1902 came Crater Lake, in Oregon, cupping blue waters where volcanic lava once boiled, and in 1906 Mesa Verde, in Colorado, with the best of the prehistoric cliff dwellings.

El Capitan in Yosemite National Park

Glacier National Park in Montana, with rugged scenery, innumerable mountain lakes and splashing waterfalls, and 60 small glaciers, the remains of great ice sheets that once covered this part of the continent, was created in 1910. Rocky Mountain National Park, in Colorado, inclosing a typical section of the backbone of the continent, followed in 1915.

The next year saw the establishment of two volcanic national parks—Lassen Volcanic, in California, which contains the most recently active volcano in continental United States, and the Hawaii National Park, containing two of the world's most continuously and harmlessly active volcanoes, as well as one of the largest extinct volcanic craters in existence. In 1917 Mount McKinley National Park was established, to include the highest mountain in North America and to protect the great herds of caribou and Dall sheep, for which the region was famous.

Then in 1919 the Grand Canyon National Park, in Arizona, and Zion National Park, in Utah, with their demonstrations of the power of wind and water as tools with which nature can carve her fantastic designs, were established, as was the Lafayette, in Maine, now known as the Acadia, the first national park to be established in the East. Nine years later the Bryce Canyon National Park, in Utah, also the work of erosion at its best, was established. Then came the Grand Teton, in Wyoming, with its great granite peaks comparable to the Swiss Alps. Nineteen-thirty saw two more national parks created—Carlsbad Caverns in New Mexico, inclosing a series of gigantic marvelously decorated limestone caves, and the Great Smoky Mountains, in North Carolina-Tennessee. Under the law establishing this latter park, however, it can not be developed for tourist travel until a certain specified amount of land is donated to the United States.

Congress has given authority for the establishment of three other national parks—the Shenandoah in Virginia, the Mammoth Cave in Kentucky, and the Isle Royale in

Michigan—upon the donation to the Federal Government of the necessary lands for park purposes. The western parks have been carved out of the public domain. Since no public lands are available in the East, the land has had to be purchased, and in the case of both the Acadia and the Great Smoky this was done by private subscription and, in the latter case, State appropriation.

The Rock of Ages, 750 Feet Below Ground in Carlsbad Caverns in New Mexico

During the early years of the present century three small parks crept into the system which are not considered of national caliber. One of these, Sullys Hill, in North Dakota, by act of Congress was turned over to the Biological Survey early in 1931 for game-preserve purposes. It has been proposed that another, the Wind Cave, in South Dakota, be used for game-preserve or State-park purposes, and that Platt Park, in Oklahoma, be made a State rather than a National park.

An incident that contributed much to park history occurred in 1906, when Congress passed an act for "the preservation of American antiquities." It authorized the President to create national monuments out of areas containing historic landmarks, historic or prehistoric structures, and objects of historic or scientific interest. The act provided that these areas were to be under the jurisdiction of the Secretaries of the Interior, Agriculture, or War. At the present time there are 34 of these monuments administered by the Secretary of the Interior, 16 by the Department of Agriculture, and 16 by the War Department. Those under the War Department are primarily of military significance, as are the national military parks, while those under the Department of Agriculture

A Stone Log in Petrified Forest, Arizona are inside or contiguous to forest lands and therefore are administered by officers of the Forest Service of the Department of Agriculture as a measure of expediency and economy. All other national monuments are under the jurisdiction of the Department of the Interior. A particularly interesting group of southwestern national monuments contains the ruined homes of prehistoric cliff-dwelling and other pueblo Indians. Others contain fossils of prehistoric plants or animals, some display huge natural bridges carved by erosions, while still others are landmarks connected with our early history. Just recently the national-monument system has been extended to the eastern seaboard through the establishment, in Virginia, of the George Washington Birthplace and colonial national monuments, the latter including historic Jamestown Island, Williamsburg, and portions of the Yorktown Battlefield.

In pursuance of an agreement between the Secretary of War and the Secretary of the Interior, legislation was introduced during the first session of the Seventieth Congress for the transfer of 10 national military and other parks and 9 national monuments from the jurisdiction of the War Department to that of the National Park Service of the Department of the Interior. It received favorable consideration in the Senate but failed of passage in the House of Representatives.

For a number of years the various national parks and the national monuments under the jurisdiction of the Department of the Interior were handled as an incidental item to the work of the miscellaneous division of the Office of the Secretary. Some of the parks were under the direct

Wilderness Areas Unsurpassed in All the World Have Been Preserved supervision of superintendents, who nominally were under the miscellaneous division, while others for a period were patrolled by troops furnished by the War Department upon request from the Secretary of the Interior.

Boating in the Magnificent Solitudes of Glacier National Park

Gradually, however, the importance of a unified organization to control these areas became apparent, and various individuals and organizations began to urge the establishment of such an organization. A series of national-park conferences were held—in Yellowstone in 1911, at Yosemite in 1912, and at Berkeley, Calif., in 1915—for the purpose of coordinating activities.

The first general officer in charge of parks and monuments was appointed in 1913 by Franklin K. Lane, Secretary of the Interior. The following year a general superintendent and landscape engineer was appointed, to reside in San Francisco and to have authority over all the park superintendents. In 1916 Congress authorized the Secretary of the Interior to appoint a general superintendent of national parks, with headquarters in Washington, and finally, on August 25, 1916, the act to establish the National Park Service was signed by President Wilson.

In April, 1917, funds for the establishment of the National Park Service were appropriated, and Stephen T. Mather, who had been made an Assistant to the Secretary of the Interior in Charge of National Parks in 1915, immediately was appointed director of the service. He served in that capacity during the 12 formative years of the service, retiring because of failing health, and was succeeded in 1929 by Horace M. Albright, who long had been associated with park work.

The Magna Charta of the national parks was written in May, 1918, in the form of a letter from Secretary of the Interior Lane to Director Mather:

> The administration policy to which the new service will adhere is based on three broad principles: First, that the national parks must be maintained in absolutely unimpaired form for the use of future generations as well as those of our own time; second, that they are set apart for the use, observation, health, and pleasure of the people; and, third, that the national interest must dictate all decisions affecting public or private enterprise in the parks. Every activity of the service is subordinate to the duties imposed upon it to faithfully preserve the parks for posterity in essentially their natural state. * * * You should not permit the leasing of park lands for summer homes. * * * Every opportunity should be afforded the public, wherever possible, to enjoy the national parks in the manner that best satisfies the individual taste. * * * All outdoor sports which may be maintained

A Lost Bit in Havasupai Canyon, Arizona

consistently with the observation of the safeguards thrown around the national parks by law will be heartily indorsed and aided wherever possible. The educational as well as the recreational use of the national parks should be encouraged in every practicable way. * * * Low-priced camps operated by concessionaires should be maintained, as well as comfortable and even luxurious hotels wherever the volume of travel warrants the establishment of these classes of accommodations. * * * You should encourage all movements looking to outdoor living. * * * The national-park system as now constituted should not be lowered in standard, dignity, and prestige by the inclusion of areas which express in less than the highest terms the particular class or kind of exhibit which they represent.

One of the first problems facing the National Park Service was that of providing accommodations for visitors. To insure the best service, public utilities, such as transportation lines and hotel and other accommodations, were given long-term franchises, operating under Government supervision as to rates and type of service furnished. The increased travel of recent years has been accompanied by a corresponding increase in facilities. Some minor forms of service are carried on under annual permit.

The living accommodations vary from luxurious hotels with every convenience to comfortable lodges, cabins, and tents, and even include housekeeping cabins and in some places cafeterias for the benefit of motor campers. Motor-transportation lines with comfortable buses are operated from the railroad terminals to and through the parks, taking in the main points of interest. All structures built in connection with the operations of the public utilities are built under the strict surveillance of park landscape experts and on plans approved by the National Park Service. The service in all cases insists that the structures fit harmoniously into their natural surroundings.

The roads, trails, automobile camps, and structures used in the administration of the parks are built by the National Park Service, also under strict regulation as to landscape requirements. Only about 25 per cent of the area of the national parks is now reached by highway, the remainder being reserved for the use of the hiker or horseman who wants to get off the beaten track. Free public automobile camps, with all modern installations, are located at convenient points along the main highways for the use of motor visitors.

The Public Is Invited to Pitch Camp in the National Parks

Although the recreational use of the national parks and national monuments is an important one, they serve a higher function in the opportunities they afford for esthetic and educational development. The very fact that each park admitted to the system must be a typical example of the particular scenery of natural phenomena which it represents makes it an excellent field laboratory for study.

That visitors to the national parks may study to the best advantage the natural phenomena in these areas an educational program is operated by the National Park Service to explain the objects of interest and to direct study. The main phases of this work are the naturalist service and the museums. Ranger naturalists conduct parties out in the field, explaining the interesting natural history exhibits encountered along the way, and give talks on natural history subjects in the hotels, lodges, museums, and about the community camp fires.

The local administration of the national parks devolves upon the superintendent, who reports to the Director of the National Park Service. Under the superintendent is a corps of clerical and ranger assistants. To the rangers are entrusted the duty of protecting the natural formations and wild-life exhibits of the parks. They also must handle traffic and assist the visiting public whenever necessary, fight forest fires, plant fish, and a wide variety of other activities.

Special engineering and landscape architectural divisions cooperate with the park superintendents in all construction work, while the educational activities of the naturalist force are directed by the educational branch of the Washington office.

All activities in connection with the administration of the national parks and monuments are directed toward two important achievements. The National Park Service, to live up to the requirements of Congress in passing the organic law, must protect these areas in their natural condition for the use of future generations and at the same time must make them available for the enjoyment and benefit of Americans of to-day.

Natural History

As an example of successful conservation the Department of the Interior offers the National Park Service as one of its prize exhibits. It has here developed group wilderness areas, scenic playgrounds, natural wonders, to which it is entitled to point with pride. Had they not been taken over by the Government and preserved their peculiar values doubtless soon would have disappeared. As it is, they will be available through the generations for the enjoyment of the public. They admittedly constitute one of the outstanding examples of the exercise of foresight on the part of the Government.

CHAPTER IX

CONSERVATION OF THE INDIAN

IT IS doubtful if any race of people since time began ever passed through such a series of life-changing influences in three hundred years as has the North American Indian, who today stands at the threshold of yet another transformation.

Recent and exhaustive investigations have found that many of the Indians on reservations are habitually idle, distressingly poor, and consequently undernourished. Although the Indian population is steadily increasing in numbers more of them proportionately die from tuberculosis than do white people. Indian babies have twice the death rate of white babies. The trouble, say the experts, is "their lack of adjustment to the social and economic conditions of the prevailing civilization which confronts them." They do not earn enough of the white man's money properly to keep themselves going. The Indian must therefore be given money-earning work to do. He must be put to work at the white man's tasks. That will doubtless lead to his final transformation and assimilation.

When white men came to America these natives were scattered thinly over the continent. Many of them were nomads, living in temporary villages and changing their domiciles with the seasons. They ate little other than the fish and game they caught. Others were more settled and engaged to a considerable degree in agriculture. Their farming was a poor attempt when compared to that of the whites, but it contributed materially to their subsistence. The food produced from these two sources, hunting and farming, was so limited that it held down the numbers of the tribes. There were probably few more Indians in what is now the United States when Columbus came than there are to-day.

Apache Girls Halfway on the Road Toward Civilization

Early in the sixteenth century Cortez in Mexico and De Soto along the Mississippi released horses on a continent where they had not existed. These horses lived and multiplied until, a hundred and fifty years later, the plains Indian had become a man on horseback. This transformed him. His range was greatly increased. As a warrior his leash strings were cut. He fared afield with much greater scope than he had ever possessed before. As a mounted huntsman he could dash in among the buffalo of the prairie and drive his arrows to their vitals almost at will. The horse would have multiplied the numbers and importance of the Indians manyfold had it not been followed by the land-hungry race that bred it.

A Pueblo Indian Sits on His Doorstep

Although the whites crowded the reds to the West, there was little struggle for land while the stretch of a continent invited. But when the white man went into the West there was conflict. The mounted, free-roving Indians sometimes proved dangerous to pioneering parties. Often they were but buffalo hunters, but it was hard to tell buffalo hunters from scalp hunters. There was deliberateness in the white man's destruction of the prairie game. Its disappearance would remove the Indian's excuse for prowling abroad in armed groups. It would make him dependent on the white man and consequently more amenable to his will.

This is a generalization which, of course, does not apply to all the tribes. In the Southwest the Pueblo Indians were settled farmers and early came under the Spanish influence. Their history was quite different. Tribes in the South, again, lived quite differently, and many of them were moved by the Government to the so-called Indian Territory, there to work out a different destiny.

The Crow Women Excel in Bead Work

The Indian wars incidental to the conquest of the West combined with the passing of game led to the confinement of the Indian on the reservation. This was the beginning of his degradation. He might no longer fare afield and live by the hunt. He might no longer make war on the white man or rival tribes. He had to sit in idleness on the reservation and wait for his rations to be dealt out by the Government. It was a life which no race nor individual could endure without injury. As a result of it this Indian, who had wrested a livelihood from nature almost with his bare hands, who had survived only through the possession of activity and hardihood, became an idler without necessity for exertion. Thus he gained a reputation for racial laziness which he never deserved.

After two generations of rations a new sun arose over his horizon. It rose not naturally but artificially, through the well-meant efforts of white men. This was the sun of education. The theory was that learning would solve all the Indian's troubles. This proved not to be a fact. After two generations of education he is still on the reservation, miserable under the pall of idleness of the old ration days.

John C. Calhoun, Secretary of War under President Monroe, in 1824, created the first Bureau of Indian Affairs and appointed a certain Colonel McKinney as its chief. In the 107 years that have intervened the Indian has been under the supervision of the Government, and when the Department of the Interior was organized in 1849 the Indian Bureau was transferred to it. The idea of education for the Indian got its first impetus in 1876, when $20,000 was appropriated to further it. After that appropriations increased rapidly. In 1879 the Carlisle Indian School, the first of the nonreservation boarding schools, was established in Pennsylvania. It was presided over by an Army officer, Capt., later Gen., R. H. Pratt. His prescription for the solution of the Indian problem was: "The way to civilize the Indian is to put him in civilization." This was little more than a paraphrase of Thomas Jefferson's statement 75 years earlier that "the ultimate point of rest and happiness for the Indians is to let their settlements and

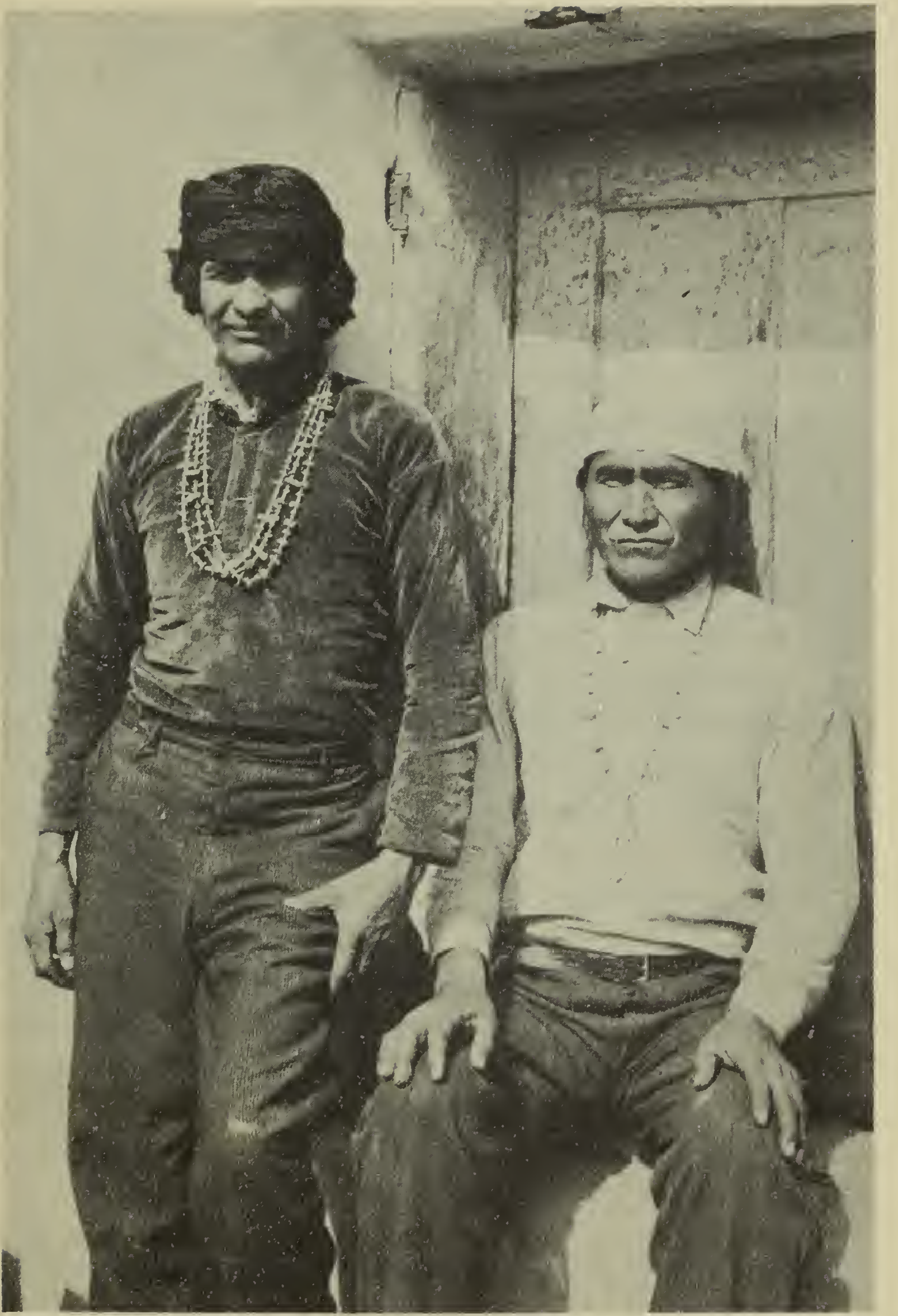
Shall She Go Back to the Shack on the Reservation or Out Into a White Man's World?

ours meet and blend, to intermix and become one people." This has not been accomplished. The Indian still seems to lack adjustment to the prevailing civilization, and it is now found that this lack of adjustment is due to the fact that the prevailing civilization works and the Indian does not.

The task of administering the affairs of the Indian has proved one of the most troublesome of governmental undertakings. Contrary to general belief, the number of Indians is probably increasing, the high death rate among them being offset by a correspondingly high birth rate, which is 50 per cent above that of the whites. During the past 20 years Indians have increased on an average of 2,000 a year, until there are now some 355,000 in the United States. It is doubtful whether there were as many Indians even at the high tide of their power as mounted hunters.

Every Indian, at least until he is officially pronounced "competent," is a ward of the Government. He may not act for himself. These wards are divided into 193 tribes, speaking 58 languages, living on 200 reservations in 26 States, and owning lands as extensive as New England and New York combined. Oklahoma, with 120,000, has the greatest number of Indians. Arizona follows with 49,000, South Dakota with 23,000, New Mexico with 22,000, California with 19,000, Minnesota with 15,000, Montana with 13,000, Washington with 13,000, and so on. The natural tendency of an agency having charge of so intricate an administration is to become absorbed in its detail and to think but little of broad general policies.

The holdings of some of these Indians in the Government's care have become valuable. The 2,229 Osage Indians in Oklahoma for some time had individual incomes from oil



The Navajos Still Are Little Affected by Civilization of around $10,000 a year, now much less. Many of the Quapaws of the same State have waxed wealthy from lead and zinc mines. Certain Indians in the Middle West own valuable farm lands, while others in Washington and Oregon have excellent timber. The Navajos, in the Southwest, own a wild empire whose wealth is as yet unknown.

These facts may lead to the conclusion that the Indians are a wealthy people. This is not the case. Those who have property of value are in a small minority. The great mass of them live on poor reservations that can not be made to contribute much toward sustaining them. They are so poor that they seldom escape the pangs of hunger.

The administration of their estates is infinitely difficult and, no matter how able, can hardly fail to call forth unfavorable criticism. If an Indian who has money coming to him entirely lacks money experience, he may immediately be deprived of it by some unscrupulous person. Doling it out to him a little at a time may have the effect of taking all incentive from him, preventing him from ever becoming productive.

For two generations the Government has been concentrating on Indian education. There are to-day some 78,000 Indian children of school age. In such States as Oklahoma many of these go to public schools along with their white neighbors. Others on many reservations attend mission schools. The Government tries hard to reach every Indian child whose education is not otherwise provided for. It maintains 126 day schools and 58 boarding schools on reservations. Then there are the more widely advertised educational institutions of the service, the nonreservation boarding schools, 19 in number, conveniently located

An Indian Girl Who Works as Maid in a Salt Lake City Home

throughout the West and drawing on all the tribes for pupils. These institutions partake of the nature of well-organized trade schools. From a general educational standpoint their curricula run a bit beyond those of the high school. From 500 to 1,000 students attend each. The schools are usually beautifully located and surrounded by their own farms, which produce food for the students and provide demonstrations of farming and dairying.

The Indian child may enter a reservation boarding school at the age of 10, remain there five years, go to the nonreservation school, and emerge with some education at no expense to himself or his family. He is the only American for whom such free education and subsistence is provided. There is no questioning the quality of the education. It is without doubt better than that which is secured by the average child of white parents. It needs, though, to be better adjusted to his inherent abilities and future responsibilities. Elaborate care is taken to do all possible for the health of the

Indians. The Indian Service spends more than $4,000,000 a year on Indian health. It maintains 99 hospitals, employs 323 doctors, 14 traveling dentists, and 359 trained nurses. Doctors who are specialists and surgeons who perform operations travel from place to place bringing the best of treatment to the Indians. Dentists travel from reservation to reservation, caring free of charge for the teeth of all school children and others who present themselves. Physicians with attending nurses are stationed at all the larger Indian reservations, and emergency attention is placed within reach of practically all Indians.

Charges made by the uninformed that the health of the Indian is being neglected are belied by the facts. It is doubtful if any other rural group of people in the world ever received so much governmentally provided medical service.

One of the principal difficulties in the way of bringing health to these Indians lies in the fact of their periodic undernourishment and their own personal or tribal attitudes toward disease. Undernourished bodies fall easy prey to such diseases as tuberculosis. Every attempt is made to provide ample medical care for the Indians, but the solution of their health problems lies in the removal of the cause, which is economic. The Indian must be put in the way of earning enough money adequately to nourish his family.

Undoubtedly the Government and the American people have wanted to do everything possible for the Indian. They have, however, made certain mistakes which they now freely admit. The greatest of these was rationing the Indian, because it plunged him into decades of enforced idleness. In its educational policy, furthermore, the Government started out with the idea that the logical calling of the Indian, a child of the open spaces, was farming. It devoted a generation to teaching him to farm, returning him to the reservation and expecting him to follow this occupation. Much to the chagrin of the service he steadfastly refused to make satisfactory use of his land.

These Indian Girls Are Being Trained as Nurses

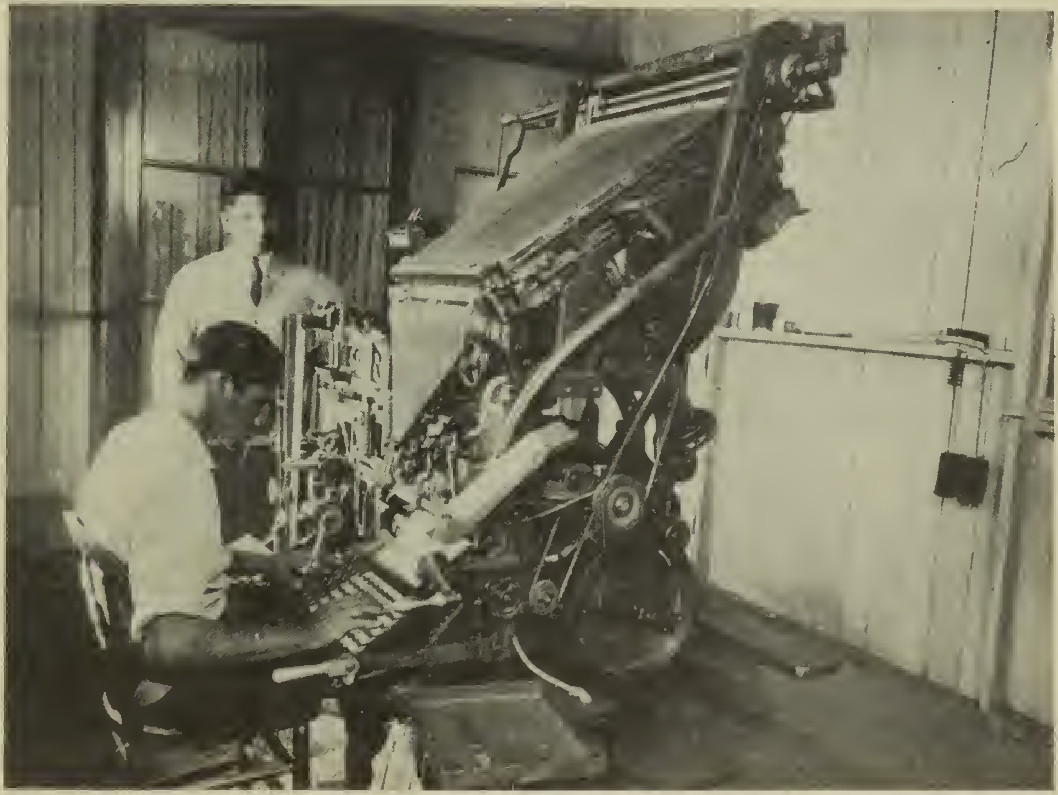
The Indian's psychology stood in his way. In many of the tribes he has always been a nomad who accumulated nothing to burden him on moving day. His philosophy was to throw away rather than accumulate. He felt no land hunger. He has been a member of a band in which everything was held in common. He is a communist. There was no incentive to personal endeavor, to accumulation of any sort. If an Indian raised a crop of potatoes, the other members of the band would move in and eat them up. On the reservation the old philosophy still prevails. The old people dominate completely, and the youngsters can not run counter to their wishes.

The Indian Has Rarely Made a Success as a Farmer

Another reason why Indians fail as farmers is that farming is a complicated business. To make a success of it one must have technical knowledge, business ability, industry, foresight, the capacity to concentrate through the years on a single purpose. The Indians are a simple and undeveloped people. They should start learning to make a living in the simplest way there is to make it—by working for hire, under direction, for somebody else. Thus they would get experience in the white man's ways of life before themselves assuming responsibility. There is ample experience on which to base the conclusion that the Indian is as fit material for industry as anybody else.

A careful study, made recently, revealed that he has a manual dexterity that is exceptional. He is fascinated by machinery and quick to learn its operation. He also takes readily to carpentry. He learns the manual trades as readily as the white boy. Those Indians who have learned to work in the building trades or shops have made good.

The Indian should be developed into a self-respecting American citizen. The Indian stock should merge with that of the Nation. Individually the Indian should be prepared for life among the rest of us. The Indian Bureau should work itself out of a job in 25 years.



Indian Boys Take Readily to Such Mechanical Trades as Linotype Operation

Indian schools, which make up a far-flung organization, have had trouble keeping themselves up to date. They are equipped to teach blacksmithing and harness making instead of auto mechanics. It takes money and time to effect changes. The old spirit of coddling the Indian must be replaced by proper training and a constant pressure toward thrusting him out into the world on his own.

If the young Indian is to participate in the white man's civilization, he must know more about it. Indian schools are institutional schools and as such are admittedly poor places in which to bring up children. Young Indians have no contact whatever with the practicalities of life. They are clothed, fed, taught in complete isolation. When they emerge from these institutions they have little training for the battle for place, which is life. Too often they are plunged back on the reservations and return to the aboriginal.

The policy of the present administration is to press steadily to get more Indian children out of the institutionalized schools and into the public schools. As the whites have closed in upon the reservations, white schools have been made available to Indian children, until more than half the Indian children are to-day in public white schools. Here they mingle with white children and learn much from these contacts. They merge into the general population. Every Indian child who appears at a boarding school now is carefully investigated; and if it is found that he lives within reach of a public school, and other circumstances permit, he is sent back home and required to attend it. Special representatives of the Indian Service have been going about the country arranging for the Indian children to enter public schools, hastening the abandonment of the institutional schools. The idea is being considered of establishing them in Government village boarding houses, paying fees to the

A Hundred and Fifty Young Indians from Laguna, N. Mex., with Wives Like This, Work as Skilled Machinists in the Railroad Shops at Winslow, Ariz.

local communities and allowing them to attend public school. Thus contact with the whites is increased and the Indian child is being constantly exposed to the civilization in which his future is bound to lie.

The Indian Bureau is building up a service to guide and place young Indians after graduation from the school. As a result many of them are being fitted into the industrial life and are finding themselves able to hold their own. Nevertheless, thousands of young Indians are constantly being thrust back into the Stone Age life of the reservation and forced to submit to it. This is particularly hard on the Indian girls who, after 10 years in the boarding schools, where they slept between sheets, bathed, ate proper food, and learned the white man's standards of morality, find themselves driven back to the reservations to go barefoot, sleep on the ground, eat out of the common pot, and, perhaps, be disposed of for a price like any other chattel.

Even the older Indians on the reservation, the bureau holds, may be provided with money-earning possibilities. An enterprising superintendent at San Carlos Apache Reservation in Arizona, for example, secured a truck that would transport 30 men. He went forth wherever within a hundred miles there was construction work, farming, mining, whatnot, and got employment for his idle Indians. At first they worked but a few days and returned to the reservation. The superintendent persisted. As time passed, however, they stayed with their jobs for longer and longer periods. In a few years these primitive Apaches were bringing $300,000 a year back to their reservation. Now scores of families live in their own homes as do other working people and ignore the old, idle life of the reservation.

Dan Inquip, a Blackfoot Indian Who Became a Railroad Man

Two of the most tragic of the reservations are those of Pine Ridge in South Dakota and the Papago in Arizona. Both these reservations are very isolated; both are in areas where farming is next to impossible. On neither is it possible for these Government wards to live other than miserably. The Indians themselves do not appreciate the possibility of a better life beyond the horizon that rims them about. Their contacts with civilization are so slight that they have not learned to venture of their own initiative into the great world outside. It is not easy to induce them to do so. If the man power of the Indian is to be conserved, however, if he is to be allowed to make his maximum racial contribution to the Nation, if he is to become an asset rather than a liability, he must be led into self-support and economic independence. On a few reservations, as, for example, that of the Navajos, this may be accomplished in his native habitat, and the Indian may continue to live for generations much as his fathers have lived. But throughout the service his greatest opportunity lies in his adaptation to conditions that exist among his white fellows and ability properly to maintain himself under those conditions. His property rights must be carefully guarded, but above all else he must be led to a self-acquired economic independence.

Encouragement of native arts and crafts is to be a prominent feature of the educational and industrial program for the American Indian, according to plans now being worked out at the Indian Office. Instead of rejecting Indian art and substituting other training, the Indian-school authorities are being urged to recognize the Indian contribution as a significant one for western civilization.

Special native teachers of Indian arts and crafts are being employed, particularly in and around Santa Fe, N. Mex., which is a center of interest in Indian culture. The Santa Fe Indian Boarding School has already been giving

Basket Making Is a Native Art Among the Indians work in native arts, and through the cooperation of the Eastern Association on Indian Affairs it is hoped in the next year to set up additional teachers with an arts shop to which Indian pupils may go for work in the arts of their own people. A day school in the Pueblo country, for example, has the services of one of the best native pottery makers of the Southwest, who is engaged in teaching Indian children the methods of her craft.

Pottery Is an Indian Art

Home-economics departments throughout the Indian Service are using Indian designs in an effort to preserve the art and protect the original simplicity and effectiveness from modern corruptions that have crept in on many of the reservations. All the Navajo boarding schools now have native weavers who teach blanket weaving to the girls. Pottery is taught at Albuquerque and Santa Fe and in the Maricopa and Hopi schools as well as the Pueblo day schools. At the University of New Mexico university officials have aided in the selection and training of Indian boys and girls for special work in art.

Applications of Indian art in home economics and industrial courses at the boarding schools include Indian designs on curtains, linen cloth, and napkins; embroidery on girls' dresses; table mats of tiling beads; beadwork for hatbands, headbands, and necklaces; weaving of plaques; Indian dolls; and designs on chairs made by Indian boys.

Perhaps of most importance for its far-reaching effect is the use by teachers in the primary grades of Indian art as part of the regular work of the school. Under former conditions, not only with Indian children, but nearly everywhere in the world, native children were obliged to give up their own experiences and make use of artificial skills from another civilization having little relation to their needs and opportunities. At the present time, however, one will find the children in Indian schools making their own reading books, descriptive of their daily lives as Indians, and illustrating with artistic picturing of their houses, their basketry, their pottery, their ceremonials. Children in the elementary grades are making baskets, using original Indian designs on clay pottery, or reproducing sand paintings and framing them.

Experts in art and archæology have offered their services in developing a program based on Indian arts and crafts, and it is believed that there is an opportunity to preserve much of what otherwise would have been lost of the Indian's contribution. Thus is it intended that whatever there is in Indian arts and crafts that is worthy to survive shall be conserved.

The Indian Service recently has been reorganized into five field divisions: Health, education, agricultural extension and industry, forestry, and irrigation, each with a technical or professional director at its head. This new staff of experts now has direct executive and administrative powers over the respective field services. These divisions are grouped under two assistants to the commissioner whose spheres are defined as "Human Relations" and "Property."

Coordination and cooperation is the keynote of the new system. For instance, the new assistant to the commissioner on human relations will be directly responsible to the commissioner for the coordination of the divisions of health, education, and agricultural extension and industry. His office will serve as the coordinating center for all reports and correspondence affecting the human program of the Indian Office. He will be responsible for the cooperation of the three divisions and will call frequent conferences between the directors and their assistants.

Scene in an Indian School in the Southwest

The assistant to the commissioner on property will be directly responsible for all activities dealing with the guardianship of Indian property, tribal and individual; land irrigation; and forestry. He will keep all the activities of his group in harmony with the plans and projects of the branches of the Indian Service which affect the human side. The responsibility of the Government for the conservation of the property of the Indian is great, and the detail of administering that property is infinite. The task is taken with great seriousness. It is determined that Indian property must be conserved until the last ward is declared competent.

This Is an Indian Home on Irrigated Land in the State of Washington

The Indian Service, with its far-flung organization, with its 200 reservations, its 170 schools, its 99 hospitals, its administration of the estates of tens of thousands of wards with property, is one of the most complicated tasks of government. It is a task that has gone on for a long time but one which has now arrived at a point where it should be liquidated. Most of the reservations are being overwhelmed by the number of whites that crowd in upon them. Most of the members of the Indian groups are coming more and more to live the lives of the dominant civilization. It is coming to be obvious that history is repeating itself and that these fragments of a race placed among other peoples of vastly greater numbers are meeting the inevitable fate of such groups and are being overwhelmed. There are a few reservations, such as that of the Navajos, numerous tribes in isolated areas, that will yet remain as peoples apart for generations. But the mass of the Indians living in such States as Oklahoma, intimately mingling with the newcomers, are changing as rapidly as do the racial groups that come from Italy or Russia. In another generation their problems will be little different from those of the average citizen. Thus it comes to pass that the obvious thing to do is to prepare for the inevitable. Though there may be certain sentimental regrets at his passing, the Indian must be prepared for his dip into that melting pot which is the parent of us all.

Zuñi Children Starting on the Road to Education

CHAPTER X

CONSERVATION OF THE CHILD

OF ALL national assets in the conservation of which the department is concerned the children of the country are by far the most important. We husband our other resources only because there are children who will need them. But we can not take it for granted that our children will live or that they will be fitted to make the most of life's nonmaterial as well as its material resources.

It is with the child's years of rapid development, covering a fifth more or less of his life span, that the Office of Education of the Department of the Interior is concerned. The office is intimately interested in the welfare of the 30,000,000 children in attendance in our public schools and in the thousands who are privileged to be under formal instruction before or after their public-school days, but it conducts no classes and supervises no teachers. Its business is that of securing and distributing such information as will be helpful to educators in their work with children. The office is in a situation to scan the whole educational field in this country and abroad, to learn what is going on, and to point out what seem to be the high spots in its ever-changing procedures.

Life is subject to change, and modern life more than ever Education is never at a standstill, whether considered transversely or longitudinally. Education is for life, and its processes must be continually adjusted to life as it is.

Life grows more and more complex, and with this change education also becomes less simple.

There is need of such a central agency which will observe what is going on locally everywhere to fulfill in his school days the present and future needs of the child. There is abundant need for such information as it can offer.

A Few of Uncle Sam's 30,000,000 Children of School Age

Time was when only the child's mind, or at most his brain, went to school. True, his legs carried him to a little building of red, or other hue, and he made use of eyes, ears, and hands in the processes that went on therein, but the condition of these tools was of little concern to the schoolmaster, and there was less interest in other physical features of the pupil. Doubtless these matters would have meant more to the master if he (or anyone else) had had any usable information on the subject. Of course, there are those who would say that the child's physical condition is wholly a matter for the home. But what if the home has not been educated, or does nothing in such matters? The school is concerned in the conservation of all the resources of the child. His physical assets come first (if there is any first) and can not be separated from his mental belongings. Both must be at their best if we would make the most of him.

The Illustrated Lecture

The process of formal schooling in the twentieth century is an expensive one (costing something like $100 per year per child) and there is waste—waste of time, waste of effort, and waste of money in trying to educate children who are not in condition to profit by their schooling. For children absent on account of sickness, the mill runs without grist, and for the child whose life comes prematurely to an end the school machinery has run well-nigh in vain.

The Office of Education has concerned itself lately with the fundamental, though unpleasant, subjects of sickness and death in children of school age. Everyone is vaguely aware that there is needless illness and preventable death, but it takes the jar of big figures to stir us out of the mental habitude with which we are apt to look upon the events of current life. The death or illness of some child is a calamity in the child's home, but it hardly ripples the surface of community consciousness. The fact, furnished

The School Now Considers Matters of Health by the Office of Education, that a child of school age dies every 10 minutes hits hard, and even those who think only in dollars and cents blink at an estimated annual monetary loss from deaths at school age of about $1,000,000,000. Panics in the stock market and war debts seem insignificant beside such annual waste.

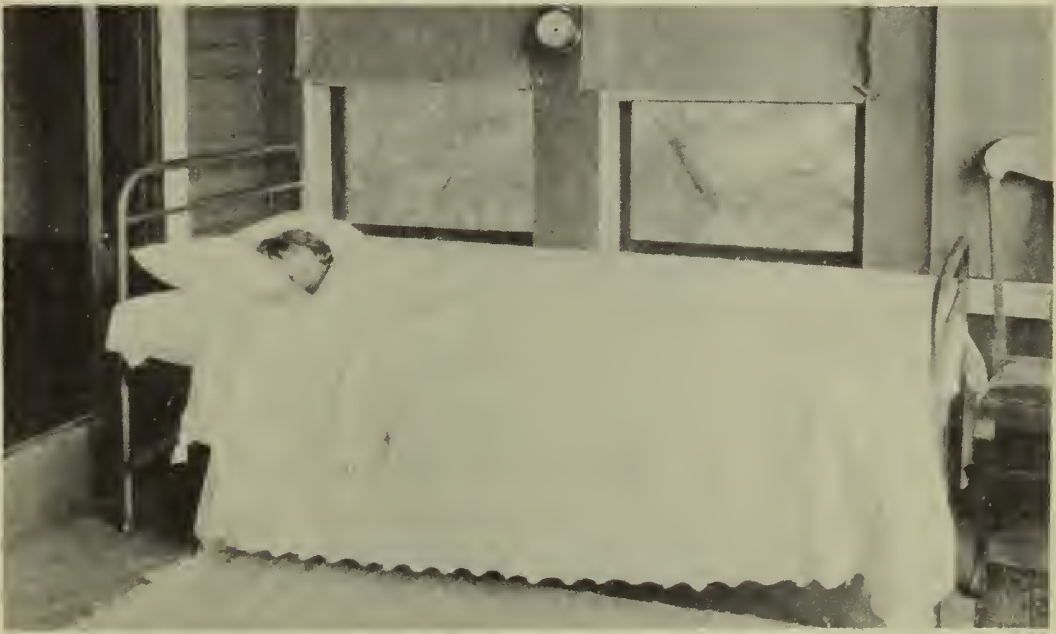
It is too much to expect that, because we are jogged out of lethargy by this information, we can at once do away with the unhappy condition. It is suggested, however, that the premature loss of life could be cut by 25 per cent. Comparisons are odious, but even with this reduction the deaths at school age would not be so proportionately low as they are in a half dozen countries abroad.

We are told that there is an average loss of some seven or eight days of school per child each year on account of illness—a total loss of 1,000,000 school years if one child lost it all. If a school is really worth attending, its efforts are wasted proportionately. If the child falls behind and can not catch up, there is added loss of time and school expenditure.

Again, we can not as yet prevent all this loss, but it could undoubtedly be discounted 25 per cent.

Hit hard by such large figures for sickness, schools are doing much, though they can not do all, to bring about conservation of life and of school days. Where the local schoolmen are not prepared to go about such saving, the department furnishes such information as is available for making school life and all life safer and more sanitary.

But because the child's life is conserved and his days in school are brought to a maximum does not necessarily mean that he is " all there " and making full use of his opportunities even when he is present. He may have been ill fed or have slept badly, and the sleepy and hungry child can not do good work. He may have eyes that see not all that is before them or ears that hear not all that is said to them. Under such circumstances there must be waste of time and effort on the part of the child and the school. School officials are fully informed as to the possibilities of waste from such causes and as to how the teacher, if no one else, may determine when a child is physically in shape for profiting by his schooling.



The Child Needs Plenty of Sleep

But this has only to do with the average child and from the physical standpoint—of saving him from premature destruction, from absence from school, and from mere unavoidable woolgathering when present. This is only the beginning of education and the conservation of the child.

In order to make the most of himself the child needs to learn the value of his own bodily machinery and how to do his share in keeping it at its best. The program of the school itself should be so planned as to conserve his physical powers. "Play is the life of the child," and nowadays there must not only be play periods in the school day but the child must even be taught what and how to play.

No Two Children Are Alike

Life after school is not all work nowadays, and his education in play, physical and mental, becomes education for the conservation of leisure time through all his days.

Not only is more leisure a feature of modern life but there is change in every direction. Education of the child in its mental aspects must keep pace with this change. The education of the past generation is not fitted for the present. While the fundamentals, the three R's, remain, methods of training in these R's change, while preparation for the more practical affairs of life becomes as varied and complex as modern life itself.

One of the fundamental conclusions of the committee on growth and development of the White House Conference was to the effect that "No two children are alike." To most of us this fact is so well known as hardly to deserve mention, and yet it is one which is too often ignored. The Office of Education would reiterate and reemphasize it. No two children are alike; and if we would make the most of each, we must find out how they differ and what can be done to meet the needs of each.

This is not so difficult with the majority, who differ in lesser degree. It is with those who vary further from the average, the "exceptional" children that the educator needs all the information available. Time was when such children simply dropped out of school. This made it easy enough for the school people and, under the circumstances, it was about as well with the child. But if you compel a child to attend school during a certain period of years and if you would make the most of his powers, you should meet his special needs at least halfway. Otherwise his schooling is a waste both for educator and child.

The physical side of the child looms up again when we think of children as different. The blind and the deaf are usually taken care of, but what shall be done with the child who can see but who by no means can be made to see as other children see? What about the child who is not deaf but yet can not hear intelligently the ordinary language of teacher or pupil or anyone else? What about the child who lisps or stutters, whose school life is more or less of a hell on earth and who in after days must confine his ambitions to callings in which human contact is nearly ruled out? There are the host of cripples, victims of infantile paralysis, tuberculous infection, and mechanical accidents. They may learn as well as others how to read and write and cipher (provided their arms are not the site of damage), but what of it if they can not get about and can not use their limbs in any calling? Are they to be a constant source of loss to society as well as weariness to themselves?

A Health Prescription Taken at the Back Door

Last but not least looms the large number of delicate children well enough equipped otherwise to make much of school life but for whom the conditions of that life (easily met by the ordinary child) are unsafe, to say the least. We refer to those who already at school age have become the prey of the tubercle bacillus to a serious degree. Within a decade after school years it is estimated that (judging by the death rate) about 2 per cent of our population are ill in some degree with tuberculosis, and the relation of this figure to that given for school children showing, by X-ray examination, tuberculosis of the juvenile form is, to say the least, ominous. Tuberculosis, though losing power as a destroyer, still takes 1 out of 12 of us, and, in our best years, 1 out of 5. The loss in life and wealth from this cause is terrific.

The problem for educators is to both conserve the child's life and at the same time make the most of his mental possibilities. The Department of the Interior furnishes to educators everywhere the information, so far as it can be obtained, as to how this can best be done.

But does the schooling we furnish meet the needs of differing children from the mental standpoint? If not, there is bound to be waste. If the child is so constituted that he can not profit by the material or methods of instruction, suitable enough perhaps for the average child, education is a waste for him; and if we do not fit him for the limitations which are bound to be his in later life, his education was a waste from its very vacuity. Besides the child with "subnormal" intelligence there is the so-called delinquent, who, innately, is no worse than his more ordinary brother but who is different and needs to be considered so if we would make the most of him.

On the other side of the average is the child of exceptional mentality who may literally "know more than the teacher" and who is in danger of wasting much of his time if that time is not rightly occupied.

But even for the children who do not differ widely from the usual, for that great majority whom we call the average, educators must consider whether, in our changing life, they are wasting their own time and energy and the time and energy of these average children (and so doubly wasting public funds). They are doing so if they do not study and meet the interests and aptitudes of the average child. They are not good conservationists if they do not keep in mind our rapidly changing social conditions and prepare the child accordingly. Education is for life and must keep pace with life. We can not afford to allow the child as he leaves school to step into nothingness rather than into an appropriate niche in the realm of vocational life, for toward some vocation he is inevitably headed.

The information furnished by this department indicates that our ambitions for the child are not always carried out, even in the measurable matter of school attendance. It was estimated in 1926 that of 1,000 children who enter school (and very few who are physically able do not enter) only 768 reach the eighth grade. Many of the 768 do not complete this grade. Of 1,000 children who enter high school only 260 are graduated. The average length of public-school life to-day is just beyond the first year of high school. However, the proportion of children attending high schools has greatly increased in

Normal Children Are Best

the past 10 years, and the average span of school life per child has very much lengthened.

Still, educators have food for thought and especially for asking whether, in the case of the students who drop out of school before the end of 12 years, the school has fully met the needs of the child. Are we conserving the child or conserving the school? Was the curriculum built around the child or was the child made to fit an outworn program planned without reference to the present-day needs of the child? Or is there a reason outside the school? By a special grant of funds by Congress an intensive study is now in progress of our schools of secondary education which will furnish to those working in this field needed information as to the conservation of youth at this period.

Interest in Food Comes Before Interest in Books

Granted that the educational needs of the child are fully met as regards what he is taught and how he is taught, there are a multitude of details to be worked out as regards the school plant, its heating, lighting, equipment,

The School Nursery Is Becoming Popular

the number of pupils per teacher for economy of service, the preparation of teachers, the health of teachers, the length of the school day, of the school term, the school year, the question of summer sessions, of the need for care of children in summer playgrounds or camps. There is the need of careful expenditures in all these matters. Information on all these subjects is collected on a nation-wide scale and made available for the school administrator through this department.

Until recently formal education was concerned with the child of school age. It was taken for granted that the education of the younger child was adequately taken care of in the home. But the home nowadays is often not a home but only a flat where the young child, often with no playfellows, few playthings, no pets, and no sign of a playground, must shift as best he may for better or worse and often not for the best. The kindergarten was the attempt to meet the needs of children in the year before school age. Dipping deeper into the preschool period, the nursery school has come into existence. While to a large degree experimental in this country, school authorities and parents are widely interested in its possibilities for conserving the young child, who in our modern life finds his environment largely barren of human associations and material resources which meet his normal needs for development. The department furnishes information in this new field.

It is not long since education went on without reference to the home. The child was sent to school for a certain number of days and a certain number of years and that was all there was to the matter, unless the child was especially troublesome to the school. Nowadays education proceeds most effectively and most economically if the constant cooperation of parents is secured. This is especially true as regards education for better health all along the line, from the securing of adequate treatment of diseases and defects discovered at school to adequate feeding and resting. We may inform the child in such matters, but his medical care and hygienic practices are a matter for the home to be interested in, to make possible and encourage. The Parent-Teacher Association with its million and a half of members is ample evidence that the home is responding to the need for cooperation with the school to the end of the conservation of the child.

The parents need information which will aid them in understanding the work of the school and their part in assisting with that work. They need, also, and desire information as to what they can do to make the most of the child's physical, mental, and moral development in the days before he is ready for school, before he can enter the nursery school or the kindergarten. The Office of Education can be looked to as a source of guidance as to where the parent can secure information along these lines.

Education for the Hands

The whole scheme of education as now set up works to a considerable degree in a virtuous circle for the conservation of our most valuable national asset. It begins with efforts put forth directly by the school to prevent waste and to make the most of the child physically, mentally, and morally. Through instruction and cooperation of parents its endeavors are reinforced and given added impetus. The child of the future will come to the hands of the teacher with a preparation which will involve less expenditure in his schooling, of time, and effort, and of public funds. He will be in better condition to profit by the efforts that are put forth in the school to make of him all that is possible as an individual and as a member of society.

A Happy Family

CHAPTER XI

CONTINENTAL CONSERVATION

OUR forefathers landed upon a great continent the future development of which was far beyond their most fantastic dreams. For a century or more they huddled together in certain chosen areas and developed a simple but satisfactory rural life. Most of the industries developed were domestic or local. With the increase in numbers that followed a high birth rate and continual immigration, they gradually extended their range over the vast expanses of the continent.

The successive waves of settlers that went down our rivers, over our plains and mountains, and eventually along our railroads carried with them little but their courage and experience. In general the conquest of our share of this continent has been of an amateurish character. This was inevitable, since science had not developed to its present state, the efficiency of government was not great, and the job of living was such an intense one that each man had to concentrate upon it in order to make a success. If we had had full information as to the natural advantages of each new area, if we had known and understood the analysis of soils, if we had had our present quality of seeds and animal stocks, a much more satisfactory result could have been accomplished.

Primarily the aim of our people was to spread over the continent a blanket of farms, each maintaining a family. The land settlement laws, such as the homestead act and others, were all directed to this purpose. In favored localities this has worked out well, but as the population pressed westward into semiarid countries it failed for the most part except in the favored valleys. If we could go back to-day and plan for the wisest location of our people upon this continent, would we not have spared the great forests which were cut down in the Atlantic and some of the Great Lake States and have hurried our people through to the Great Plains?

The Homesteader's First Crop on the Plains

For the most part trees were the greatest antagonists of the settler. The battle against the trees was the battle of many of the pioneers. To-day we are conscious that trees are the only suitable plants for many of the thin-soiled areas that have been cultivated almost to their destruction. The contest between the new land and the old has been a constant factor in American agricultural and economic life and is still going on in various phases in our country as well as in others. In the taking over of new land, its first values were harvested as promptly as possible, and then it was for the most part driven to the maximum of production for a considerable period.

With Irrigation the Pioneer Transformed the Desert

Gradually, with the shifts and changes and with the development of a more intelligent understanding of the fundamental problems, we have been acquiring new conceptions of continental conservation. Conservation is a term around which much confusion has reigned. Conservation means wise use. Wise use means that a natural asset shall be used for the proper purpose and at the right time. Conservation does not mean the hoarding of natural resources for a hazy, indefinite future. It does, though, mean intelligent and thoughtful planning for every resource of our continent.

The usual action of the Federal Government has been to distribute land resources into private hands as fairly and rapidly as possible. Certain artificial conceptions, such as that of the acre, have been used in dividing up our continent just as we have divided up our cities into town lots of arbitrary size and shape. This has been done largely regardless of the quality of the soil, the amount of vegetation, the water supply, the climate, or those other factors upon which all of the values of the soil, in so far as the habitation of human beings is concerned, depend.

The result of this has been that there has been a large marginal failure in almost every zone throughout the country. In the best areas of the Middle West this process has not been so evident, but throughout the Rocky Mountain region and the Western States the tragic skeletons of abandoned homes tell the gaunt and heartless story of human hardship and of a contest with nature doomed to failure. Purely artificial procedures and arbitrary decisions are not apt to fit well unless all the

Abandoned Homesteads Mark Many a Tragic Failure conditions are favorable. This whole sad process of failure could have been avoided if we had understood the problems of spreading a great population over a continent for successful living. In this process we have recklessly harvested such readily available resources as the forests. We have thought only of their evident use and have failed to see their significance in protecting watersheds and their profound relationship to life in the valleys. Only recently as a people have we sensed the value of our river systems and our water supplies in general.

Some years ago it became evident that our loss in trees would seriously handicap us for lumber. Large portions of the conifer-bearing mountainsides had been unsuited for homesteading and human habitation in general, so that they had remained in the possession of the Federal Government. The great national-forest system was wisely set aside to be retained as an asset of the people rather than to have distribution into private hands.

Hidden beneath the surface of this land of ours were great stores of coal, oil, natural gas, and minerals of many varieties stored there through the ages. In the more thickly settled portions of the country these rapidly came into the possession of private individuals, who developed them in accordance with existing economic practices and demands. Fortunately immense stores were so distant from the market or so hard to master that they were left intact, although they were subject to entry as mineral claims. Until the Federal leasing act was passed discovery of these resources led to their transfer to private hands.

These mineral resources, while extensive, can never be replaced. Anything that is irreplaceable should be conserved and protected for its fullest use. Some of these mineral resources have been set aside to carry on that prime function of the Central Government—national defense—but some still are held in abeyance ready to be used under one plan or another whenever they are required or can be economically mined and used. Certainly for the control of these great resources some form of national strategy is desirable, and many factors are now operating to bring about better control and one freer from waste in their development.

The Prospector Was a Forerunner of Civilization

The native deserts of the Southwest hold a never-lessening fascination. Aside from their charm there is likely to be a feeling that there lie in them latent possibilities which we are not yet able to grasp. The plant life of the desert, for example, has traveled farther from the waters of the ocean in which all such life is held to have originated than any other. It has solved the riddle of happy existence here on the desert where all else perishes. The barrel cactus, for example, standing out on the arid plain where most plants die, with its abundant inner pulp almost as moist as the heart of a watermelon, is one of nature's most astonishing oddities.

It is not unlikely that there are possibilities in these plants that defy the desert that could be turned to the uses of man. In Hawaii, for example, it is found that the mesquite tree of the deserts has been set to grow and is proving itself of great material value. Under the more favorable conditions of the islands it grows more abundantly and more rapidly. It yields wood for the fires of the Hawaiians. It yields abundant beans which they feed to their livestock. It yields a harvest for honeybees which is being turned to good purpose. In some similar way almost any of these desert plants may come into unexpected usefulness.

The desert itself may come to serve new uses that rise out of its peculiar characteristics. Already it has grown into importance as a region where those who are ill may seek to recover from their misfortunes. We do not know what other purposes it may come to serve. It should be held unmarred in its present condition. The plants that are native to it should remain undisturbed. The lizards, horned toads, road runners, and cactus wrens should be allowed to continue the lives of their fathers. There has been much talk of this sort of conservation and that. Few have spoken for the conservation of the desert. Yet the deserts belong to the Government and should be held unspoiled against the time when their proper utilization may be found.

As we look back we see that our conquest of the continent has been accompanied by many failures and we now often have desolation and shabbiness instead of those wonderful natural conditions built up through centuries of time. We begin to see as we look forward the vague outlines of a future policy which will bring about a more intelligent use of our natural resources and which will restore some of the values we have lost. Trees are being planted, abandoned farms are going back into National and State forests and parks. New conceptions of taxation are appearing. Slowly but gradually we are using each part of the continent in the way that is most profitable.

The Future May Find a Use for This Desert

This will be a long and slow process, associated with much human unhappiness and misery; but mistakes are costly and nature is unrelenting in carrying out her own program. Our greatest difficulties in getting the best out of our continent in the future will come from our own actions, from the artificial decisions that we have made or will make regardless of natural conditions.

There are many misfits between our political units and our geography. There is a great maze of legislation built upon so-called property and human rights which will constantly handicap the necessary changes associated with an increase in population and a rising standard of living. Social elasticity permits a people to meet nature on even terms. Social rigidity is a constant handicap. Life is never static. Our lives and our actions are always in a state of motion, of change, and of flux. Our accommodations to a continent will inevitably take place. If we can see what they should be, we can advance faster. Science has placed a whole series of new tools in the hands of man in dealing with all these questions. Engineering has permitted us to

The Engineer Has Given Us Roosevelt Dam, in Arizona, Which Supplies Water for Irrigation and Power for Industry control nature in many ways; organization has given us the chance to unite our financial and other resources in the applications of science and engineering to the problems of life.

If we halt and look about us to see what this is all about and what we are trying to do, we are at once confronted with the fact that in so far as our continent has values it will be those that we as human beings give to it. It is people rather than things that give us our real interest. For tens of millions of years no human eye saw our land.

Dairy Barns Have Replaced the Wigwams of the Indian

When those early pedestrians crossed the Bering Straits and began that march which eventually led their descendants to Cape Horn of our neighboring continent to the south, they had but little idea of the possibilities of a modern civilization. For them there was sufficient opportunity to secure food and shelter in simple ways. It has been only within a little more than a century that through science and government we have been able to show that exuberant growth which is possible to man when he can use his energy in the presence of abundant natural resources and guide his efforts with a trained mind and with the help of the expert in thousands of fields.

Contrast the standard of living of the Indians who resided in Wisconsin a century ago with that of the dairy farmer of to-day. By the use of the trained human mind, the trained hand, and the machine, which is the product of both, we have brought in a whole series of new opportunities for the mind and body of man. A great public educational system is only possible where there is sufficient economic strength so that all of the energy of every capable person is not required to cover the back or fill the stomach. We have made possible new intellectual and spiritual values for every human being. For every one of our citizens, young and old, we have opened great new avenues of happiness. Our active transportation systems have permitted us to become continental minded instead of local and provincial in our concepts and in our thinking; we can enjoy together the many beauties of our continent.

There has been a great expansion of the mind of America with these developments. If we had proceeded too long without thought and without mobility, we would have found many of our people trying to live upon an ash heap. We are still in danger with soil erosion and other natural processes unless we can conserve for our future certain basic and fundamental elements of our surroundings. Primarily our whole safety as living units depends upon

We Need to Get Our Children Back to the Normal Life of the Country the plant life about us. Controlled plant life has given us our agriculture. The plant life of the past has given us our irreplaceable resources in coal, oil, and gas. These plants working away in the presence of sunshine and water to make food for themselves and for us and our domestic herds are our most valuable material possession. These plants depend entirely upon the rains, the soil, and the sun. Conservation, control, and management of plant life will determine the future of the people of America upon this great continent of ours. Thoughtful conservation and distribution of plants in accordance with our needs and the places where they can produce the most are the fundamental requirements of continental conservation. We can exhaust our stored mineral resources and still survive, but we can not destroy our plant life and succeed.

To live close to nature is a joy that grows upon nearly all of us with passing years. The successful man of the city usually wants a suburban home or a farm. The land has a call to humankind. In our great economic development in the massing of huge populations in close proximity to turning wheels and spindles we are in danger of losing our safe biological position. We must endeavor to restore trees, plants, and birds to such of our urban areas as we can. We must distribute urban populations over wider areas as rapidly as we can. Many of our newer contrivances make it possible to bring to the distant country home those advantages that have so long been thought to make city life superior.

Whatever we adults may think, children need to put their feet down on the ground itself, to come in immediate contact with trees and grass and birds and flowers, and to breathe the pure air and the freedom of the countryside.

Far from Bricks and Pavements

The adjustment of a people to its environment can take place through a thoughtless struggle in the survival of the fittest, or it can be a planned, quiet, and orderly process of human organization. Have we not reached the point here in America where all of these forces working toward betterment can be coordinated?

Of late, happily, we have been giving thought to the well-being of our children. The potential possibilities of any child are the most intriguing and stimulating in all creation. Life and time are our only real possessions. Our children are to have their home on this continent. Their lives are to be spent in the surroundings we leave for them. Is it not time for us boldly, thoroughly, and thoughtfully to guide the future management of our natural environment? Our spaces are broad, our range is great. We are but started on our way. We must study our estate and conserve its manifold values. How can we best care for our children in the broadest possible national sense? Under what conditions shall we bring them up? How shall we teach them to do better by our country than we have in this past century of rash and hurried exploitation? We need to do more than to give them food, clothing, training, and health protection. We must lead them to see the basic relations between themselves and nature and help them to protect, care, and plan for that part of this great earth which is in our possession. To do so they must live closer to the soil. Bricks, pavements, and concrete, factories and lofts, tenement houses and alleys are poor places to learn of nature, poor places to train boys and girls to think in terms of a continent.

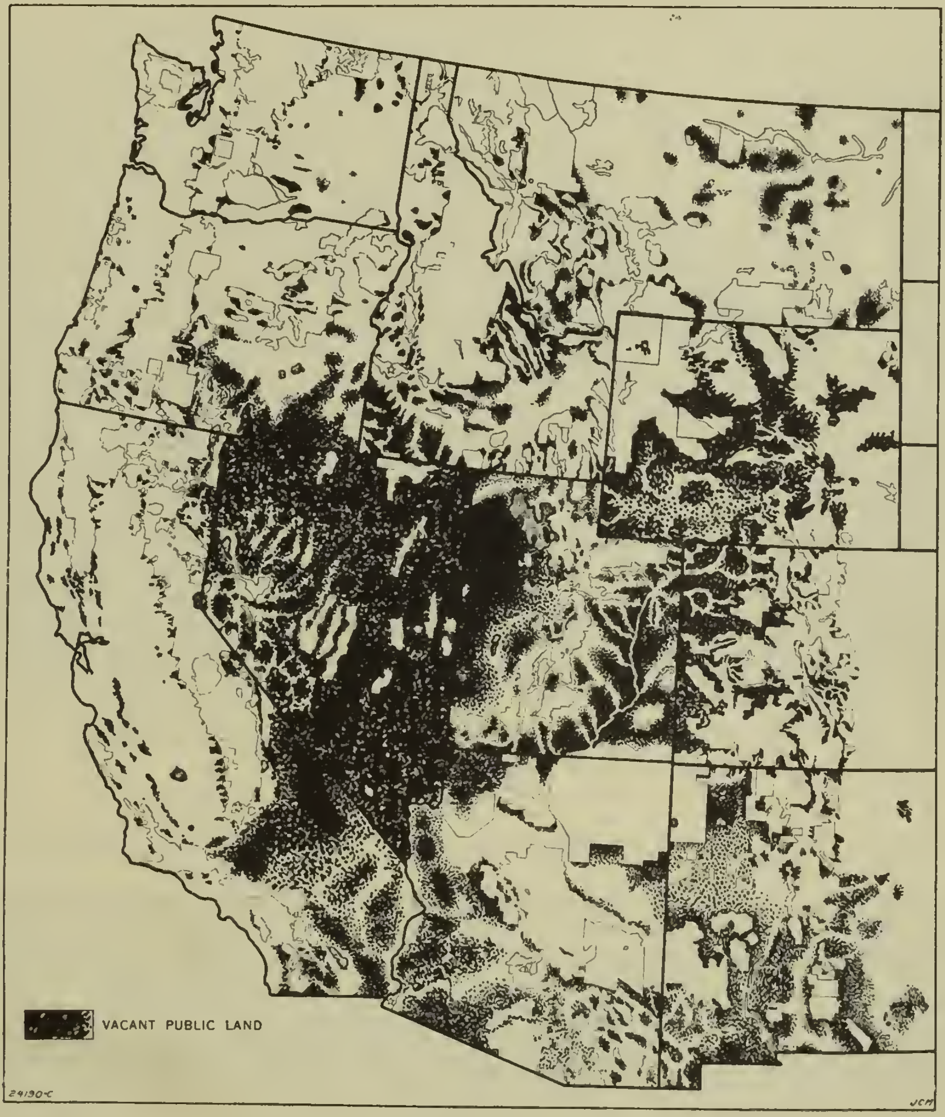
It is the child in the rural home who has the maximum biological opportunity and the best chance of understanding our ever-present contest with natural forces. Our problem in the future will be to provide him with education and health opportunities equal to that of the city child. The proper organization of our governmental units, the proper distribution of our wealth, and a thoughtful consideration of the needs of the child will not only make this possible but give the maximum advantage in the long run to the rural child. This means a rearranged distribution of educational, social, medical, and other services which we can use upon the highways, automobiles, telephones, and radios, and the various paraphernalia which are transforming country life. The Office of Education, which is a part of the Department of the Interior, is a governmental agency on which rests a fundamental responsibility in this respect. A deliberate effort to equalize individual opportunity for all of our children, regardless of their location, for out of this equalization will come that strength to our people which will permit us to carry our civilization forward into the centuries. This accomplishment is one of the master tasks of conservation. We can be secure upon this great continent if we can conserve its values through intelligent action. The prime aim for us as human beings in the conservation of the continent is to care, protect, and plan wisely for those who will inherit it. The day of the amateur in the conservation and preservation of our continent and our child life is past. The highest possible use of all that we know or can discover will be needed if we are steadily to advance. We must unite all of our skills and our wills in working out the destiny of the American people and the continent which is its home.

Chapter XII

THE COMMITTEE ON THE PUBLIC DOMAIN

THROUGH the year 1930 a committee on the conservation and administration of the public domain prosecuted an extensive study of the problems of the West. That committee had been appointed by President Hoover. Its purpose was to set up where all could see the problems of conservation as they exist to-day. The members were as follows: James R. Garfield, chairman, Cleveland, Ohio; Elwood Mead, representing California; I. M. Brandjord, Helena, Mont.; R. K. Tiffany, Olympia, Wash.; Rudolph Kuchler, Phoenix, Ariz.; Charles J. Moynihan, Montrose, Colo.; George W. Malone, Carson City, Nev.; William Peterson, Logan, Utah; I. H. Nash, Boise, Idaho; Perry Jenkins, Big Piney, Wyo.; E. C. Van Petten, Ontario, Oreg.; Wallace Townsend; Little Rock, Ark.; H. O. Bursum, Socorro, N. Mex.; George Horace Lorimer, Philadelphia, Pa.; James P. Goodrich, Winchester, Ind.; Gardner Cowles, Des Moines, Iowa; Huntley N. Spaulding, Rochester, N. H.; W. B. Greeley, Seattle, Wash.; Mary Roberts Rinehart, Washington, D. C.; and Francis C. Wilson, Santa Fe, N. Mex. In addition the Secretary of the Interior and the Secretary of Agriculture were ex officio members of the committee.

The committee came to the conclusion that the remaining public domain is attracting a rapidly decreasing number of homeseekers, it being generally unsuited for permanent settlement. Even the entries for stock-raising homesteads of 640 acres are slumping. More than half the filings on such homesteads had been allowed to lapse.



The Government Still Owns the Black Areas

There are extensive areas in every public-land State which have been entered under this act and then abandoned to Russian thistle and other weeds, some poisonous and destructive to ranges formerly valuable to the stock raiser. Ruined fences and abandoned homes dot the landscape for many miles, pitiful evidence of human hopes buried beneath the economic insufficiency of 640 acres in a semiarid section as a stock-raising unit to support a family.

The Federal Government Should Cease to Be a Party to the Establishment of Homes Like This That Are Bound to Fail

It is not fair to our ex-service men and other homeseekers, the committee thought, to continue in effect an act which has resulted in so many failures and so much misery to settlers. At least it can be stated that little of the land not now entered holds out any hope of economic sufficiency for the permanent establishment of a family on 640 acres unless there is considerable adjoining grazing on the public domain. The uncertainty of the future as to that feature renders a venture on the strength of it perilous indeed. The Federal Government should cease to be a party to the inducement.

The surface of the public domain, the committee continues, is now and always has been a great grazing common, free to all comers. It is unlawful to fence the land, and no public control has ever been exercised over it. For years recognition has been general that there has not been a wise use of it. To-day overgrazing has taken its toll in the form of large areas unfit for grazing, or a greatly reduced carrying capacity for livestock generally. Erosion has increased by the destruction of forage cover, and the silting of streams and river flow-as an aftermath has added to the problems of range and farm and reclamation. The damage done may never be wholly repaired nor yet its progress wholly arrested; but as a continuing evil it may be diminished, and by proper scientific treatment and regulation many ranges may be steadily improved and carrying capacity increased.

The immediate as well as the ultimate use of the public domain for grazing purposes is a matter of grave national concern, because of the fact that upon that area enormous herds of sheep, cattle, and horses are raised. It should be remembered that about 50 per cent of the sheep and 16 per cent of the cattle of the United States are raised in the public-land States. Hence any serious depletion of the ranges upon which these herds graze is of direct concern to all the people of the United States.

Fifty Per Cent of the Sheep of the Nation Are Raised in the Public-Land States

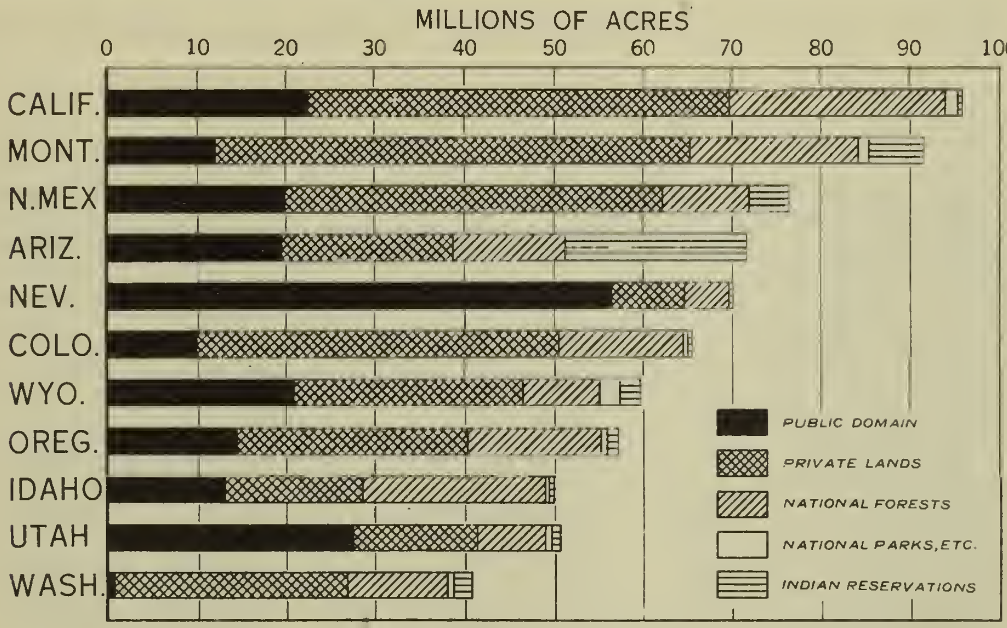
Upon the point that some form of regulation of the range is an immediate necessity there is no room for disagreement. The only question is as to the agency which shall be charged with the duty of regulation and the development of the range.

The committee suggested two methods for dealing with this problem: The first was the transfer, with certain reservations, to the States, of the public domain within their respective areas, reserving to the Federal Government such subsoil mineral resources as are now reserved in the Federal Government. The second was the creation on the public domain of a national range to be administered by the United States.

The transfer of the public lands to the States would mean that each State would be charged with the sole obligation of conserving and using the range. The experience of the public-land States in dealing with the large areas now owned by those States and suitable for range shows that in many instances this administration has been effective and salutary. It is true that the public-land States, as their development increases, are becoming increasingly conscious of the value of conservation. The mistakes of the past and the lessons to be learned from that history have not escaped them.

In the event national ranges are created, the committee says, careful consideration should be given to the selection of the Federal agency to be charged with their administration to the end that they may be under a unified control of and under men who are intimately familiar with the conditions of the ranges, wisely established customs of stockmen, the needs of contiguous areas, and the movement of herds and flocks from summer and winter ranges, regardless of political or topographical divisions.

In the event a State accepts the public domain within its areas, says the committee, a number of problems arise. It is apparent that all rights must be protected and the proper forum provided for their definite determination before the transfer of title to a State. The problems involve not only private interests but likewise the interests of the Federal Government. What, for example, should be done about reclamation?



This Chart Shows the Ownership of Land in the Western States

The public-land States include that vast arid portion of the country where farming is not possible without irrigation. Congress early recognized this essential difference from the rest of the country where settlement under the homestead laws brought about full agricultural development, and enacted the desert land and Carey Acts to supplement the homestead law. Under these laws, by private and community effort, the essential agricultural development of the West received its first impetus. The limit of development by private enterprise was reached when the low-water flow of the streams was all appropriated and it became necessary to provide storage of the floods to be held for use during the dry season. The high cost and long development period of these large projects made them prohibitive from the standpoint of comparatively short-term investments, and many well-intentioned efforts in this direction resulted in total loss of investment not only by the promoters but by thousands of settlers as well. This led to the enactment of the reclamation act designed to make possible in the arid States the building up of farm population and production in fair proportion to the steadily increasing urban population of those States based

The Government Stopped the Flow of Such Great Streams as the Rio Grande. This Is Elephant Butte Dam in New Mexico upon mining, lumbering, and, along the coast, shipping and industrial pursuits.

The reservation of certain vast resources within the Western States for future national needs is one of the major factors making it impossible for these States at the present time to finance their own reclamation requirements.

The reclamation act was originally conceived to supplement private enterprise by the construction or completion of projects beyond the resources of private promotions and individual or collective means. That conception rapidly grew and expanded until the theory of the right of the United States as the proprietor of public lands to improve them by reclamation and irrigation was fully recognized and took form in the construction by the Federal Government of great reclamation projects devoted primarily to that purpose.

Although the development of Federal reclamation is of tremendous importance to the West, the value of crops grown on irrigated lands in these projects is only three-fourths of 1 per cent of the total crop value of the Nation.

Fundamentally it may be said that reclamation has surmounted the barriers of aridity, controlled and converted for useful purposes the menace of the flood, pushed back the frontiers of the desert, and subordinated them all to the service of the purposes of our forefathers in their efforts to establish permanent homes and prosperous communities on the public domain.

The reclamation of the arid and semiarid West is assuming proportions of increasing significance as knowledge and experience enlarge the useful field of our first endeavors and reveal the multiplicity of problems involved in the

Irrigation Has Brought the Dates of Sahara to the Southwest development and protection of every project. Drainage, colonization, flood control, erosion, power, and kindred subjects have in fact or should become major pieces in the mosaic which is now the Reclamation Service.

In order that no part which is important to the whole shall be omitted, the committee says, the integrity of the reclamation fund must be guarded carefully. Approximately 67 per cent of the annual income to the fund is from project collections, about 26 per cent from royalties under the mineral leasing act, leaving 7 per cent from all other sources. The primary factor, then, is the safeguarding of project payments, and the secondary is the insurance of the future maintenance of accretions from the royalties received under the mineral leasing act in a percentage at least substantially as at present. The administrative policies of the Reclamation Service, if undisturbed, will assure the first, and nature has apparently undertaken to underwrite the second.

Comparatively recent discoveries of great oil and gas fields in California and New Mexico, where a portion of the public domain participates in their riches, should supply for years to come from permits and leases now in good standing the desired percentage. The public domain in Wyoming has been by far the greatest contributing area in the past and is at present giving promise of continuing that aid. The public domain in Montana, Utah, and Colorado has been and continues to be a hopeful prospect for the future. The immense deposits of coal in the public lands of the Western States, ranging in character from lignite to anthracite, and the deposits of phosphate, sodium, and potash constitute a resource from which future supplies of fuel and fertilizer materials may be derived for national use and will produce an increasingly large revenue. Thus any disposition of the unreserved, unappropriated public domain which does not disturb that desirable condition will withstand attack upon any theory of injury to reclamation.

Under This Salt Surface in a California Desert Is a Lake of Potash

Moreover, such disposition should be made, with such reservations to the United States, as may certainly provide for future projects when and as economic conditions justify the undertakings.

Much has been accomplished toward flood control by projects already constructed primarily for irrigation, and the Hoover Dam project will reach the apex of achievement for the arid West in that respect. But the far-reaching benefits of each successful project in the protection of lands below the impounding works serve only to intensify recognition of the immensity of the field still unoccupied. None of the public-land States is free from the danger and devastations of floods; but the flood which wipes out a prosperous community or destroys an area in an agricultural district is a national and regional as well as a State calamity, varying in importance only to the extent of the property destroyed and the number of lives wasted. Whether it be the Mississippi at flood with its dreadful potentialities, or the Rio Grande above the Elephant Butte, or the Colorado above Black Canyon after that project has been completed, or any stream in the West subject to the same destructive forces in flood time as are these great river systems, the principle that the problem of control is national and regional, as well as State, remains the same and should be recognized. It varies only in terms of solution, the difficulties, and the costs. It calls for cooperative measures between the Nation and the State, or States, if more than one is benefited, and a just division of costs based upon an appraisal of the benefits received. As an incident to flood-control projects, the generation of power and the development of water for irrigation can be made to pay their part, but the frequent practice of the past of loading all the costs upon the shoulders of the landowner is inequitable. Recognition of that principle appears in the Boulder Canyon project act, under which electric power pays for the dam.

The policy should be enlarged to include all projects now under way or hereafter undertaken until a definite plan of Federal participation has been evolved. Reservoir sites on the public domain have already been located and reserved, and others should be, with a view to future requirements. On interstate streams such sites should be reserved in the United States until the States, by compact ratified by Congress, shall determine their position in the set-up agreed upon by that means.

Control of the Flood Waters of Such Streams as the Colorado Is a National Rather Than a State Problem

Conservation, says the report, has been defined as wise use; but the definition does not satisfy, because what constitutes wise use is the subject of unending controversy. In retrospect we may readily detect the errors of our predecessors and to a limited extent correct them, but our prospective vision is clouded by the human limitations of life and mind. We do know that waste of any natural resource, whether it be one not replaceable because the alchemy of nature can not be duplicated or one renewable by natural processes of growth and rebirth, is a wrong to the generations that will succeed us. The aim of each generation therefore should be to reduce waste to a minimum and to eliminate it where possible. At least, conservation carries a mandate to that extent.

But there is, in the opinion of the committee, a distinction between wanton waste and that which is not voluntary and results from imperfect and inefficient methods of production and utilization in industry and from overproduction. The first can be remedied by invoking the police powers of Nation and State; the second, only by the education of our people under an enlightened and courageous leadership. In the latter field the usefulness of the Federal agencies is not measurable by, nor dependent

Oranges from the Desert Seem to Meet the Definition of Conservation as Wise Use upon, nor confined to, the ownership by the United States of a relatively limited quantity of natural resources appertaining to the unreserved, unappropriated public domain. Rather should we think in terms of a practical idealism, relying upon a leadership with ample resources, marshaling the forces of research, of intelligent publicity, of wise instruction on the elimination of waste from production and fabrication and on sound economics, leading the way to a clear understanding of the reasons why waste is the inevitable companion of the uncontrolled production of any natural resource when carried to an unusable excess above the normal requirements of the consuming public.

In every public-land State the United States is the owner of vast resources, surface and subsurface, outside of the vacant, unreserved, unappropriated public domain.

The existence of mineral resources in the public lands generally results in the withdrawal or reservation of such lands, and thus their removal from the unreserved, unappropriated public domain. It follows that, theoretically at least, what remains unappropriated and unreserved at this time is for the most part nonmineral in character.

An important exception probably exists in the presence of oil and gas beneath the surface of a relatively small area of the present public lands. Most of the promising area is now covered by permits to prospect for oil and gas issued by the Interior Department under the mineral leasing act of 1920, and would be excluded in any grant to the States through the clear-listing processes of the General Land Office. In effect the areas covered by permits are withdrawn from the public domain so long as they are in

The Solitary Domain May Be Transformed into a Scene Like This good standing. On June 30, 1930, there were 676 oil and gas leases and 6,482 permits to prospect for oil and gas outstanding, covering an estimated area of 15,000,000 acres.

Oil on Government Land in Kettleman Hills, California

From the standpoint of participation in conservation programs of the near future by the United States the last figure has vastly more significance than present withdrawals for oil and gas and for oil shales. Present waste in the oil and gas industry can be laid largely at the door of overproduction. To bring about some measure of co-operation to reduce that dangerous factor the prorating of pipe-line runs and the unit operation of a producing field have been suggested and are being tried out. Both methods promise relief if legal difficulties and individual instances of selfishness do not bar the way.

So far as leases issued by the Secretary of the Interior are concerned, following discovery by the permit holder or his assigns, the power to require the lessee to enter into prorating or unit-operation agreements is lost the moment the lease takes effect, and to that extent the control of the Federal Government over this important feature of any conservation program is gone. The committee suggests that if the mineral leasing act does not give sufficient authority to the Secretary of the Interior to include provisions in the lease reserving the right to him to require of the lessee or his assigns compliance with agreements for prorating of pipe-line runs, or for unit operation, as the case may be, of a field where two-thirds in interest of the operators in the field have so agreed, then the act should be amended to give him that authority.

The reason for the conclusion is that the permit gives only the right to prospect until oil and gas are discovered, whereas the lease gives the right to produce, and it is at the latter juncture that the danger point impends and should be averted if possible.

If the Grass Cover Is Maintained, Erosion Will Be Avoided

Under present conditions, especially as to the permit situation as above stated, it is unlikely that the States accepting the grant would acquire much land valuable for oil and gas. The discussion, therefore, is not particularly pertinent to such grants except in so far as the example of the Federal Government would be valuable as a precedent for those States which now have the same or similar problems before them in connection with presently owned State lands.

In dealing with the conservation of the public domain it is recognized that erosion is playing an important part. In large areas erosion of the soil is shown to be more rapid than where settlement began. This is even serious in certain areas.

The balance, established by nature, between soil type, gradient, vegetative cover, and rainfall has been disturbed. There has probably been little change in rainfall during the past 100 years; the gradient and soil type have remained the same. The greatest disturbance has been in the vegetative covers. Plant growth depends on plant food and moisture. The limiting factor in plant food is usually nitrogen. The nitrogen has its supply in the organic matter of the soil. The nitrifying bacteria live in this organic material and make available nitrogen. If the vegetative cover is grazed too closely, the annual organic contribution to the soil gradually grows less. The plants become stunted, even starved, and the better forage plants, such as grasses, give way to poorer plants, even poisonous plants. The multiple-root system of grasses is lessened. The partial sod cover is replaced by isolated plants. Less moisture is retained after each rainstorm. Nitrogen which is available for plant food is soluble. More run-off means chemical erosion of plant food.

When the soil is denuded to this condition it will readily disintegrate. The surface is broken and gullying begins. Erosion is a problem associated with the hazards of floods and silting of streams and reservoirs. Whenever the amount of organic matter in the surface soil of any part of the public domain fails to maintain, erosion becomes a problem of conservation. Experiments indicate that from 10 to 15 per cent of the total plant growth of the year should return as an organic contribution of the soil in order to maintain the forage cover. When the plants have been greatly denuded, it may take from 30 to 40 years under wise use to rehabilitate the area.

As Rain Water Cuts the Plain That Is Without a Cover of Vegetation

The perpetuation of the plant food tied up in the organic matter of the upper soil determines the value in forage growth; measured in grazing, it is as vital a factor in conservation as is the wise use of oils, gas, or mineral and, if it could be measured with the same accuracy, would show a value running into millions. The preservation of plant food, soil cover, and normal erosion is a problem in conservation on the public domain for future administration.

The committee arrived at five general conclusions.

It thought that all portions of the unreserved and unappropriated public domain should be placed under responsible administration or regulation for the conservation and beneficial use of its resources.

A Western Landscape

It believed that additional areas important for national defense, reclamation purposes, reservoir sites, national forests, national parks, national monuments, and migratory-bird refuges should be reserved by the Federal Government for these purposes.

It was convinced that the remaining areas, which are valuable chiefly for the production of forage and can be effectively conserved and administered by the States containing them, should be granted to the States which will accept them.

It recommended that in States not accepting such a grant of the public domain responsible administration or regulation should be provided.

It believed that when a conservation program based on uniformity of Federal and State legislation and administration is developed and accepted by a State, its mineral resources should be transferred to the State under such restrictions as will properly safeguard the accepted principles of conservation and the reclamation fund.

The committee made 20 recommendations.

It wanted Congress, under prescribed conditions, to turn over public lands to the States.

It wanted public lands in States not accepting them administered as "national ranges."

Pompey's Pillar

It wanted nonmineral lands transferred to the States in fee simple, but known minerals, together with the right to take them out, reserved to the Federal Government.

It wanted certain forest, national park, and reclamation areas excepted until their status was determined.

It wanted authorization extended to the proper officials to swap lands with States and private owners in the interest of consolidation of holdings.

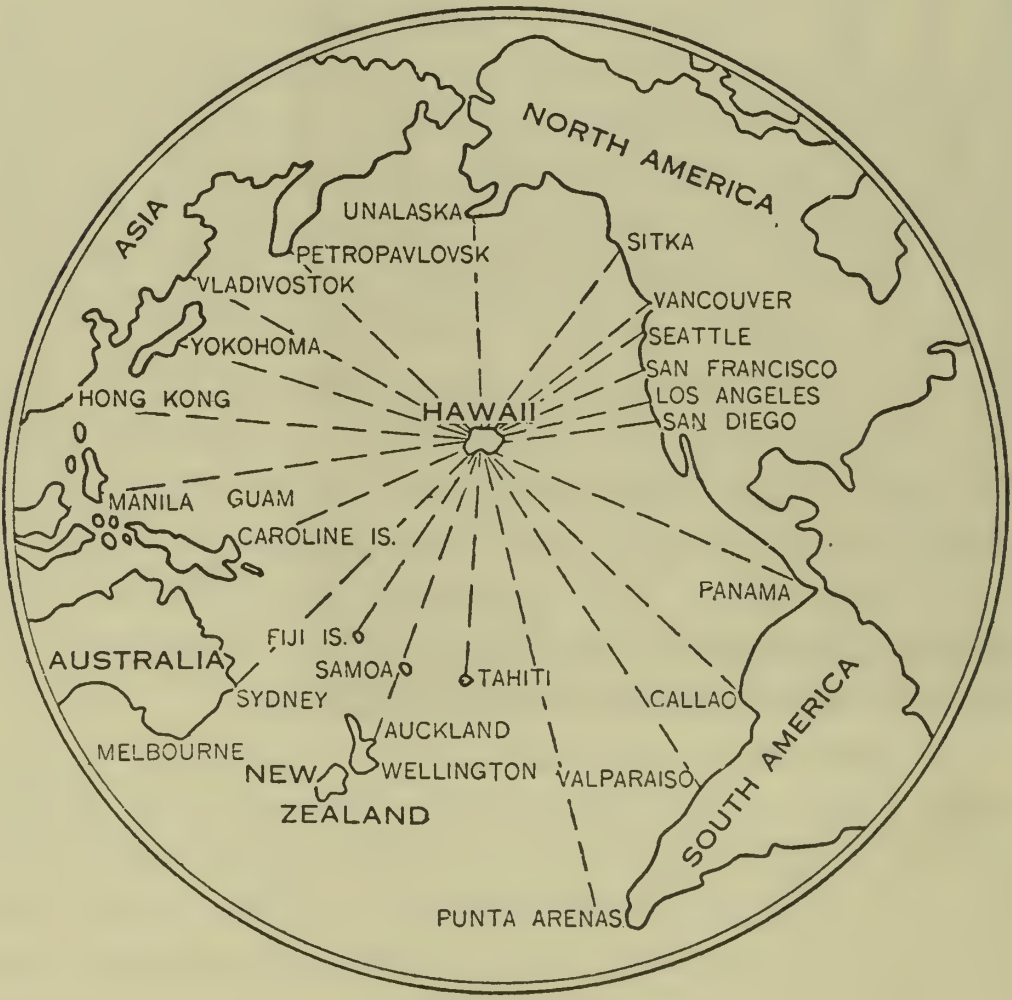
"To provide for a more effective administration of the public domain and the various reservations and areas now under the control of the Federal Government and to promote the conservation of natural resources," it wrote, "it is recommended that the Congress be asked to authorize the President to consolidate and coordinate the executive and administrative bureaus, agencies, and offices created for or concerned with the administration of the laws relating to the use and disposition of the public domain, the administration of the national reservations, and the conservation of natural resources."

CHAPTER XIII

TERRITORIAL ADMINISTRATION

THE Department of the Interior administers the affairs of the Territories of Hawaii and Alaska, the one laved in tropical seas and the other thrusting Point Barrow into the Arctic Ocean where American soil extends farthest north; the one rocked peacefully in the lap of plenty and requiring little attention and the other in the vast spread of its arms presenting a multitude of problems. Then, recently the Virgin Islands, Caribbean stepchildren of Uncle Sam, have been placed under that department in the hope that careful nursing may lead toward increasing strength and vigor. In each case problems of conservation and the development of natural and human resources have presented themselves. The geographical locations of these three dependencies of the United States in themselves suggest the probable diversities of these tasks.

The happiest of these assignments has been the Hawaiian Islands—4 big and 19 little ones strung out for 1,600 miles and lying tropically but 20 degrees north of the Equator, 2,100 miles from California. These islands have prospered, developed, and lived happily for more than three decades under the Stars and Stripes. They came to the United States of their own free will in 1898, and territorial government was established in 1900. Temperatures which are considered ideal for living out of doors change little through the year. The moisture that is wrung from trade winds blowing from the northeast and climbing the leeward sides of high mountains produces abundant vegetation and furnishes water which often is carried to more arid plains and used for irrigation. Sugarcane and pineapple grow in abundance and excellence and produce satisfactory reward for industry. A third crop, the itinerant tourist, adds to Hawaiian prosperity.



Hawaii in the Mid-Pacific

Seven thousand miles across a blue expanse of water would be a long trip indeed if it could not be broken. Hawaii, midway between the Orient and the Occident, is an unusually attractive stopping-over place for ships that cross the great Pacific Ocean. Due to this central location and its contacts with Japan, Siberian Russia, China, the Philippines, Australia, New Zealand, the South Sea Islands, Canada, the United States, Mexico, and South America, Hawaii is now becoming of more than commercial importance. It tends to become a cultural center as well as a neutral ground where the nations bordering the Pacific may meet to discuss their common problems. Here the Orient and the Occident meet on a basis of absolute equality. Freedom from superiority complexes and absence of social color lines furnish a field of happy social endeavor. Hawaii's educational, business, and religious foundations are American but stern, and Puritanical ideas here have been softened and mellowed by the native kindliness of the Hawaiian.

Aloha Tower in Honolulu Harbor

Hawaii, at the crossroads of the Pacific, had a charming civilization long before it voluntarily became a part of the United States. Back in the eighteen fifties, before railroads had crossed the Rockies, California families used to send their children to this mid-Pacific kingdom to be educated. Sugar became the chief product of the islands and tariff walls barred it from its logical market, the United States. Annexation leveled those walls, and the result has been decades of prosperity.

The Spirit of Hawaii Speaks Through the Leis Given Departing Visitors

A governor appointed by the President, a Delegate to Congress elected by the people, sitting in the House of Representatives but without a vote, and a legislature of 15 senators and 30 representatives constitute its government.

The governor reports to the Department of the Interior, which is Hawaii's link to the United States Government. He is appointed by the President, but a well-recommended Hawaiian citizen is always chosen. His appointment is the only point at which the Territory of Hawaii falls short of self-government.

Washington has always held to the theory that it would participate only where necessary or helpful in the administration of affairs in Hawaii. It has maintained an Army base there, a divisional post with some 10,000 troops always in quarters. This is the largest Army post maintained anywhere by this Government. Pearl Harbor has been developed as a naval base. These are merely America's military outriders to the west and have nothing to do with the administration of the islands themselves. Hawaii National Park, with its group of active volcanoes, is a unit in the far-flung scheme administered by the National Park Service of the Department of the Interior. In this same park for decades past, also, has been located another representative of the department, Dr. Thomas Jaggar, world-famous volcanologist, an employee of the Geological Survey. The Department of Agriculture maintains experimental farms in this land of tropical vegetation, which conduct many studies, and staffs which fight insects and rodents that interfere with crop cultivation. The Department of Commerce maintains many stations of the Light House Service. These agencies contribute greatly to the well-being of the Hawaiian Islands, and the benefits accruing from them have come because these islands have seen fit to join up with the United States.

When sugar became the chief product of Hawaii the labor of producing it was done largely by the natives. When that labor supply became inadequate Chinese were introduced, followed by Koreans, Portuguese, and Japanese. So great were the numbers of these orientals that as early as 1907 it was found to be necessary to apply the exclusion laws to them. The planters thereafter fell back on

Hawaiian Portuguese Chinese

Filipino Japanese

School-Girl Types in Hawaii

Filipinos, who still were allowed to enter since their homeland also was in a way American. Thus it came about that East meets West in Hawaii. A fusion of races making up a population of 370,000 is in progress that challenges all time for its counterpart. There are but some 20,000 full-blood Hawaiians left, with twice as many of part Hawaiian blood.

There are 65,000 Caucasians, 25,000 Chinese, 65,000 Filipinos, and 140,000 Japanese. The children of all of these for a generation have mingled in schools such as prevailed in Iowa, back in the States, and emerged English-speaking American citizens, a bit yellow skinned and almond eyed to be sure, but with every right vouchsafed to those born in Virginia and descended from colonial stock.

With the exception of the cities of Honolulu and Hilo, the people of the islands live largely in small towns or villages, and children come to centrally located high schools and grammar schools in auto buses, as the roads of the Territory are well developed.

The schools of Hawaii are well organized from the standpoint of curriculum and teaching methods. Teachers are well trained and are all graduates of a recognized normal school or hold the equivalent of an A. B. degree from the University of Hawaii or some mainland college or university. Teachers come chiefly at the present time from the Territorial Normal School and the University of Hawaii, and they are, of course, representative of the racial groups mentioned. In the main they are progressive, keen, and alert. The many problems of education in the islands are being worked out by practical, scientific methods in keeping with the best ideals of progressive education.

Industrial and vocational education is well taken care of under the Smith-Hughes plan. A department of home economics supplies school luncheons in most of the schools with student help under skillful supervision of teachers.

Despite all this mingling of races, no unpleasant incidents of importance have developed. The children of all these races, growing up side by side, seem to be one in their enthusiasm for and loyalty to the United States. They live happily together, and racial clashes are almost unknown. All participate in government, local and territorial, and the result is comparable with best of successes in Anglo-Saxon communities. Political graft and bad government are almost unknown. Hawaii is a land of good feeling, toleration, happiness, pleasant living. Few communities approach more nearly to the ideal of self-government. Washington looks on with approval, lends a hand here and there, almost never exercises even a suggestion of civil authority. A far-away land and a strange and conglomerate people are being conserved in such a way as to produce a prosperous and happy community.

A Hawaiian Crater, Two-Thirds of a Mile Long, from the Air

The contrast of physical setting and governmental problems could hardly be greater than it is between Hawaii and Alaska. This latter possession is America's last great frontier. Sprawling in such a way that its arms would reach from Norfolk to San Diego, its area is approximately equal to that of all the States east of the Mississippi. It lies halfway on the air route from New York to Tokio. Its three great mountain ranges give it mineral wealth and water power. Its plains are comparable in virgin value and size to the Corn Belt of our Central States.

Great coal veins are exposed on its hillsides, some to a total thickness of 200 feet or more, and there are great hidden stores of gold, copper, and tin. Its forests are perhaps its greatest resource, with spruce, hemlock, birch, and cottonwood in billions of feet. The rainfall varies from 15 to 200 inches, so that there are almost unlimited

Coal Discovers Itself on the Hillsides of Alaska possibilities in the development of water power. With 26,000 miles of seacoast, the annual harvest of fish alone is now worth $50,000,000. Its glaciers offer unparalleled mountain scenery.

There is the widest variation in its climate from the areas with heavy fog and thick vegetation to dry plateaus like those of North Dakota. The temperature varies from 50 below on the tops of the mountains to 80 above in some of the valleys. The animal life is unique. Fox, seal, and reindeer offer the greatest opportunities.

The Government-Owned Railroad in Alaska

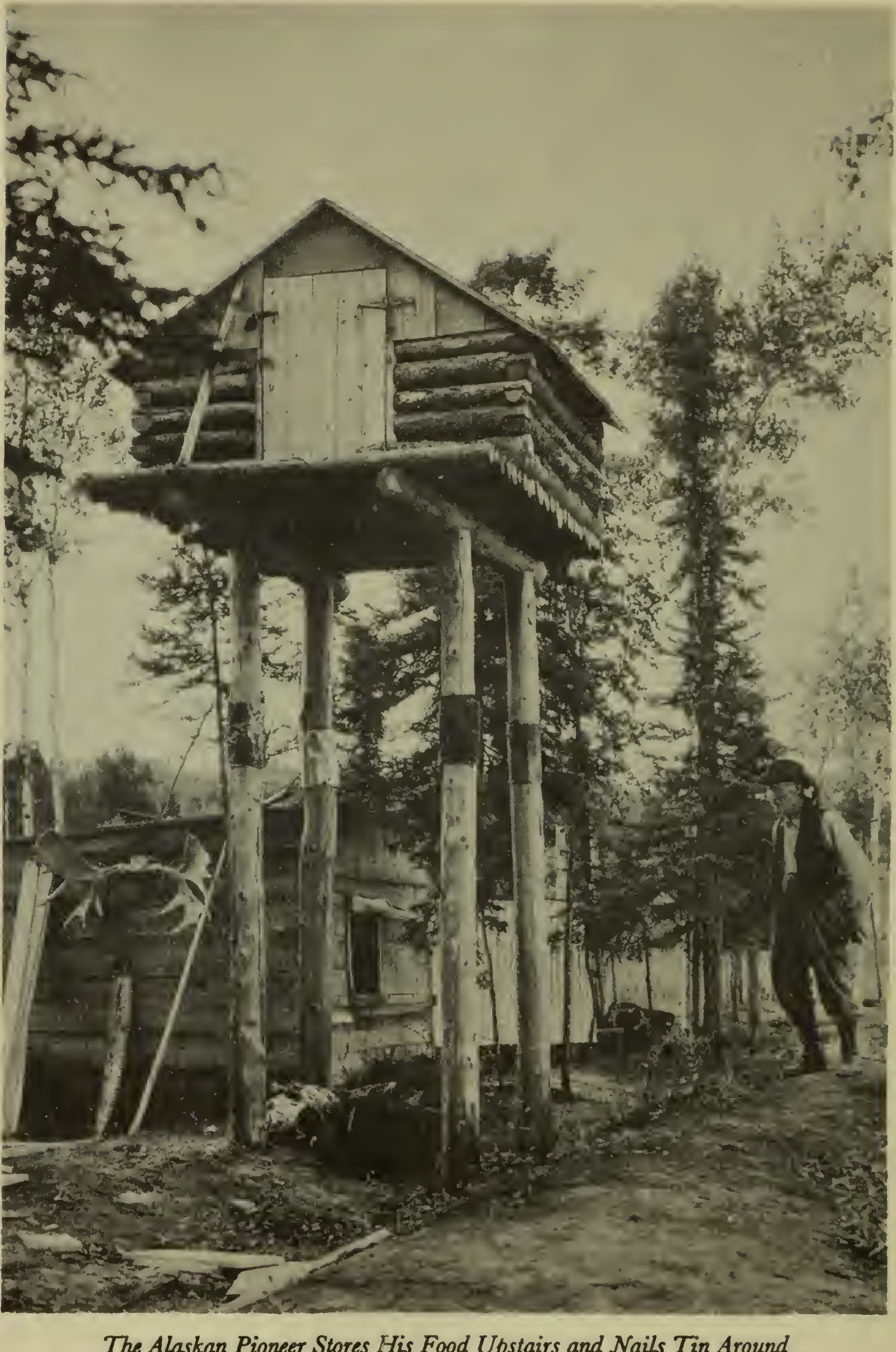
Most Alaskans are, like all pioneers, full of visions and dreams of the future. As a people we know but little of the Territory. We have yet to appreciate its many values.

Alaska stretches far out into the center of the North Pacific. It brings us near to Russia, China, and Japan. It contributes much to making the United States one of the great nations of the Pacific area. Naturally this vast territory offers many problems to the conservationist.

Alaska, which had up to 1867 belonged to Russia, was purchased in that year by the United States for the sum of $7,200,000 in gold. From 1867 to 1877 Alaska was nominally governed by the War Department.

Thereafter for two years, between 1877 and 1879, the Treasury Department, through a deputy collector of customs, administered the affairs, this service being in turn succeeded by the Navy Department, which had charge of the Territory until civil government was established.

The influx of settlers, after the discovery of gold in the Klondike, marked a new era of development. In 1899 Frank C. Schrader, explorer for the Geological Survey and still in service, came down the Yukon after tramping various areas never previously seen by white man. At the mouth of the river he heard of a gold discovery at Nome, farther up the coast. He went up to make a geological reconnaissance. He found that the gold was being washed out of the sand along the beach. The waves beating there through the centuries had sifted out the light material but the heavy gold had remained. Schrader found, 15 miles inland, a geological beach where the waves had beaten previous to some upheaval of the long ago. It appeared to the geologist that the ocean had beaten longer on the old beach than on that of the present. The sands, therefore, should be more refined, should yield more gold. Schrader made a map of this ancient beach, wrote a report of it, published the report. Nobody paid any attention. A year later a prospector with his pan washed out some of the sand at the inland beach. There was gold in it. It yielded the greater part of the wealth of Nome.



The Alaskan Pioneer Stores His Food Upstairs and Nails Tin Around Its Supports to Stop the Bears

Coal has been found at many places in Alaska, and the Matanuska coal field has been yielding around 100,000 tons a year. The Copper River Valley has important deposits of copper already productive. Silver has been found. Huge dredges are procuring increasing quantities of gold from the gravel deposits in the Fairbanks area, while the Alaska-Juneau is one of the great gold mines of the world. Altogether $600,000,000 worth of mineral products have come out of Alaska since the United States bought it for $7,200,000.

McKinley, the Highest Mountain on the Continent

The Department of the Interior has steadily advanced the development of the Mount McKinley National Park in Alaska, that its unique wealth of animal life and its magnificent scenery may be easily accessible to the American touring public. Mount McKinley is the highest mountain in North America and, in addition, has the distinction of rising higher from its base than any other mountain in the world. Not even the Himalayas rise so far above their base. Of McKinley's total height of 20,300 feet above sea level, the greater portion, or about 17,000 feet, rises above timberline and above the tundra-covered plateau stretching away on its north and west. Two-thirds of the way down from its summit the mountain is blanketed in snow, upon which the summer-long sunshine plays. Great glaciers flow down its southern and eastern slopes.

Especially interesting are the herds of wild animals that roam through the park and that are increasing steadily under the protection afforded them by park authorities. The caribou with its large antlers is picturesque and in great herds roams the vast plateau at the base of Mount McKinley. Mountain sheep also are found here in large numbers, and moose and the great Alaska brown bear often may be encountered. The Alaskan grizzly is also in evidence.

Alaskan Reindeer

The world has never witnessed two more curious examples of conservation than those of the fur-seal herds of the Pribilof Islands and the reindeer herds of the mainland. Pelagic sealers had reduced the seal herds to a few thousand at the beginning of this century when they were taken over by the Department of Commerce. Through protection their numbers have been increased, until to-day there are nearly a million of them which promise soon to be producing 100,000 sealskins worth $2,000,000 every year.

The reindeer, on the other hand, are handled by the Department of the Interior. There were no reindeer in Alaska until 1,280 of them were brought over from Asia some 40 years ago, intended chiefly as an added food supply for the Eskimo along the Bering Sea and the Arctic Ocean. It was found, however, that an area as big as the State of Texas in the north and west of Alaska could be used for raising reindeer, and the herds have steadily spread. There are now over 600,000 of them, promising the development of a new and important stock-raising industry on a basis new to the world.

Recently a reindeer council was created consisting of the Governor of Alaska, the chief of the Alaska division of the Office of Indian Affairs, the superintendent of reindeer in Alaska, a representative chosen by and from the Eskimo reindeer owners, and a representative of the private interests which own the largest individual herds in Alaska. The reindeer council was instructed to formulate range rules and regulations for the control and further development of the herds and plans for the sale of reindeer meat.

Heaviest of the responsibilities of the Department of the Interior in Alaska has been that for the health and education of the native population. There are 12,000 Eskimo American citizens scattered along Bering Sea and the Arctic. The Aleuts, who are part Eskimo, part Indian, and part Russian, live as great a distance west of San Francisco as San Francisco is west of New York. Far into the interior, where reach the Yukon, the Porcupine, and the Koyuku Rivers, live the Athabascans, most isolated of all human beings on this continent. It is probable that there are groups of Americans at these headwaters who have never been seen by white men and who do not know that a world beyond exists. Down that fringe of Alaska that reaches farthest south, where the climate is warmer, are to be found the Thlingets, the Hydas, and the Metlakatlans, not unlike the Indians of the Northwestern States.

At Fairbanks, Alaska, Is the Farthest North University in the World

In villages that range in population from 30 to 400 these people live, each village largely a unit unto itself.

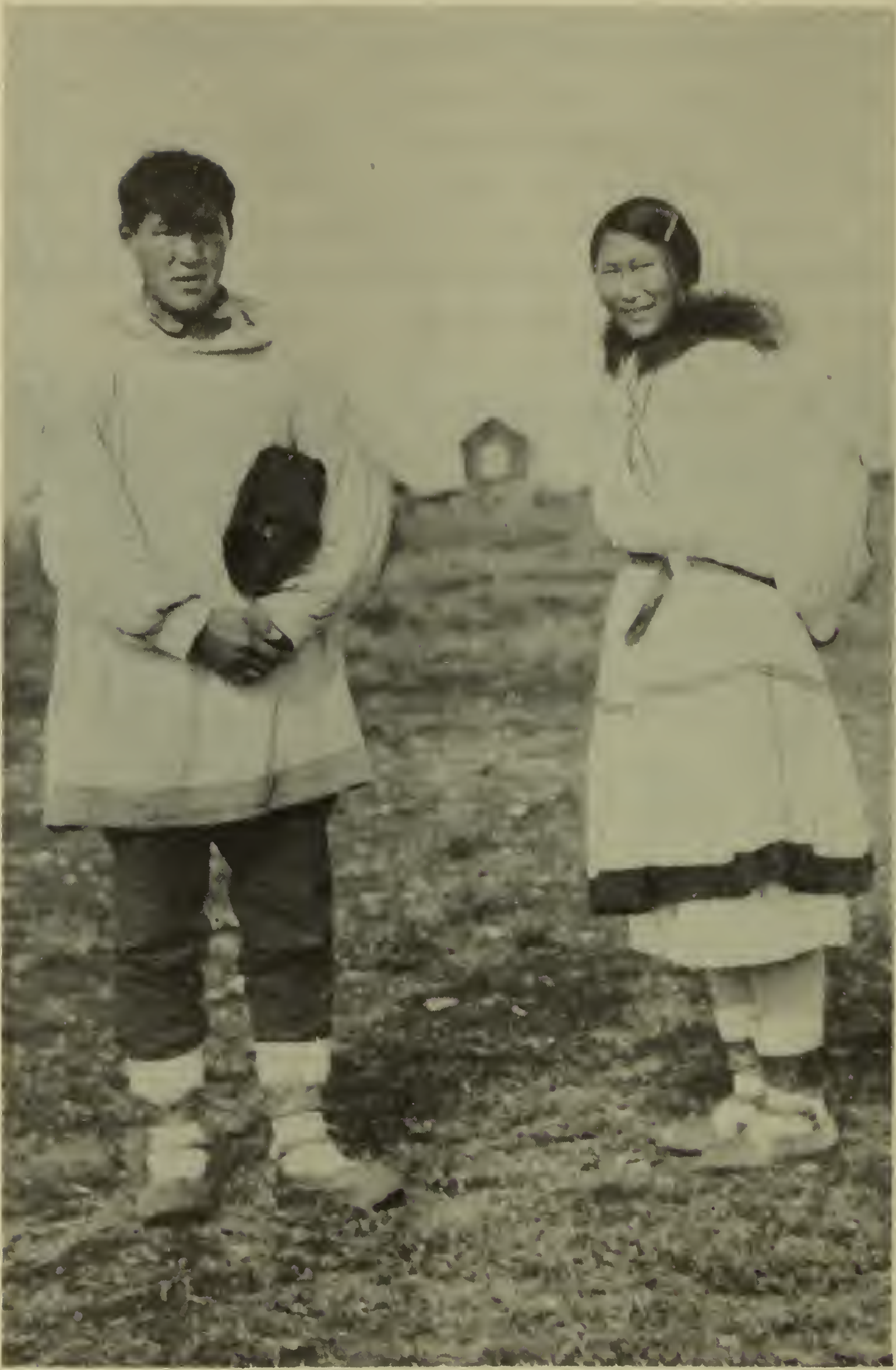
Already many Eskimos have replaced their igloo homes, which were dirty and insanitary, with houses built largely under the direction of American schoolteachers. They are coming to live as do civilized people. The young Eskimos all speak English and read and write. They have been taught ventilation and personal cleanliness.

Into these communities go American teachers. A man and his wife may be stationed at a point far out on the Aleutians. A zealous young woman may go alone to a native inland village hundreds of miles from the nearest railroad and there remain for years, snowed in for months at a time. A venturesome youth may take a place in the Arctic and find, in the molding of a human community out of a plastic race, a task so fascinating that he lingers long in working out his experiments.

In the Alaskan native community the school is the center of all activity, social, industrial, and civic. The teacher is guide, leader, and much else the community may demand. To be "teacher" in the narrow schoolroom sense is the least of his duties in Alaska. He must often be physician, nurse, postmaster, business manager, wireless operator, and community builder.

Responsibility for the health and education of these natives, on which $1,200,000 was spent in 1930, rested with the Office of Education until 1931. It was then transferred to the Indian Service as an administrative agency better fitted to carry on this work.

The Government operates and every year loses money on a railroad in Alaska, running from Seward, on the coast,



A Young Eskimo Couple Dressed for Church on Sunday Morning

470 miles to Fairbanks. It was largely in the hope of developing activities along this railroad that would give it sufficient freight to make it pay that Congress, in 1931, appropriated $250,000 for continuation of the investigation of the mineral resources of Alaska. Geological Survey parties, working in Alaska, may provide information as valuable as was that of Schrader at Nome a third of a century ago, and possibly it will be as unwisely disregarded.

School-Teachers in Alaska

The present policy of the department is to thrust as much of the government of Alaska as possible back to Alaska. Looking to that end, the President has appointed three Alaskan commissioners, resident in the Territory, and has placed much responsibility on them. These commissioners represent departments of the Federal Government in Washington, and each has charge of important elements of administration in Alaska. They are George

Parks, Governor of Alaska, representing the Department of the Interior; Dennis Winn, representative of the Department of Commerce, having charge of fishing problems in Alaska; and Charles H. Flory, representing the Department of Agriculture, and having charge of farm, stock, and forestry problems in Alaska. Each of these commissioners has long been a resident of Alaska. Each retains his post as representative of his department and adds to it the duties of commissioner. It will be their business to settle in Alaska many matters that have hitherto come to Washington for determination.

Seward, Gateway City of Alaska

Strikingly different from the administration of the affairs of Hawaii or Alaska is the task presented by the three principal and two score minor Virgin Islands, on the Atlantic side, outriders to the east of the whole West Indian group, and the most easterly land owned by the United States—1,000 miles toward Gibraltar from Key West, Fla., 40 miles from Porto Rico, 1,400 miles southeast of New York City. These three principal islands are St. Thomas, St. John, and St. Croix. Their dimensions are, respectively, 13 by 2, 9 by 5, and 22 by 6 miles, and they have a combined area of 132 square miles, which is about twice that of the District of Columbia. Only St. Croix is important agriculturally. There are about 22,000 people in the Virgin Islands, a decrease of 5,000 in the last 20 years, of whom but 8 per cent are white. A peculiarity of this population is that the women outnumber the men by 20 per cent. This results from the emigration of laborers to the United States.

The language of the Virgin Islands is English, despite the fact that they were a Danish possession previous to their purchase for $25,000,000 by the United States in 1917. They were bought because they then seemed to have naval strategical value. Their importance as a cable station disappeared with the advent of radio, and the use of oil lessened their importance as a coaling station. Their once important position as a port of call for steamships had disappeared and their population had materially decreased before we took them over. Bay rum is one of the most characteristic products of the islands. Special potable rum made in St. Croix had a limited market which was lost when prohibition became a law. The production of sugar, which for a time was profitable, is now no longer possible on any considerable scale because of the competition of more favored lands elsewhere. Conditions in the islands have grown steadily worse, commencing, however, long before acquisition by the United States. The Danish governors' reports were a continuing account of depression.

From the time of their purchase until 1931, the affairs of the Virgin Islands were administered by the Navy Department. The President, by Executive order, and upon the recommendation of the Bureau of Efficiency, then transferred them to the Department of the Interior. Congress at the same time made quite liberal appropriations for the establishment of civil government. A governor and a technical staff were appointed, proceeded forthwith to the islands, and began to wrestle with the problems.

St. Thomas, Virgin Islands

Agriculture, obviously, must be the main reliance of this community. Already much has been done toward getting a garden plot into the hands of every family and toward encouraging its members in the cultivation of that plot. In an effort to get the land into individual ownership, plans are under way making it possible to file upon and acquire homesteads. Agricultural instruction is being improved and reforestation is under way. Particular attention is being paid to the development of bay trees, from which bay rum, an important product of the islands, is extracted.

Bluebeard Castle in St. Thomas

The acquisition of these islands has thrust upon the United States one of those odd tasks that so often fall to its lot. Their possession places upon it the responsibility for doing the best it can under the circumstances. As a task in colonial administration, this one is brand new. Years will be required in showing material results. The task in conservation faced by the department is that of converting this possession into an asset, of leading this group of people into a self-respecting prosperity.

CHAPTER XIV

CONSERVATION IN THE GEOLOGICAL SURVEY

THE Geological Survey has groups of specialists out in the field constantly checking over those assets of the Government lying between Key West and Point Barrow in the conservation of which the American public may have an interest.

That agency has, in fact, a conservation branch which is concerned directly with the disposition and use of the public lands of the national domain. The survey classifies the public lands with respect to mineral, power, and agricultural value. It supervises the development of any mineral and power values that are reserved by the Government. It is the consulting geologist and consulting engineer of the Government on questions of public-land utility. It serves as supervising engineer in the expanding fields of mineral and power development under Federal permit, license, or lease.

Back in 1905 an inquisitive survey geologist detected wholesale fraud in the acquisition by far-sighted interests of valuable Wyoming coal lands as "agricultural land" under the homestead laws and brought the matter forcibly to the attention of his superiors. Casual surveys disclosed like conditions elsewhere in the public-land States of the West, affecting not alone the mineral resources but the water-power resources as well, and revealed a need for prompt, drastic action to prevent further looting of the Nation's treasure.

Vast areas throughout the West believed to be valuable for coal, petroleum, natural gas, phosphate, or potassium minerals, or to involve possibilities of water-power or water-storage development, were withdrawn from entry. This brought strikingly forward the necessity for an adequate study of the wealth of the public domain and methods for its conservation.

Much of the Government's remaining empire in the West does not appear very inviting from a car window, but the geologist is in his way a detective who picks up odd clews that may point the way to hidden treasure. After "reading the rocks" these geologists have had set aside for further examination 60,000,000 acres for coal, 5,000,000 acres for oil and gas, 4,000,000 acres for oil shale, 2,000,000 acres for phosphate, 9,000,000 acres for potassium, and other odds and ends.

Working for the Geological Survey

The Nation's mineral fuels which have been derived from the remains of plants and animals through the long geologic past—before the appearance on the earth of man, their user—represent stored heat from the sun. At best, future supply and demand can only be approximately measured, but the recognition of the limitation of raw materials has emphasized the desirability of assembling all available information concerning the country's stock of mineral fuels. This is one of the Survey's tasks in conservation.

The Boundary Line Between Canada and Alaska

The coal deposits of the country have been studied with a view to determining the quantity, quality, and geographic distribution of the coal that is still in the ground and available for future use. Workable coal beds, according to estimates prepared by the Geological Survey, underlie an area of half a million square miles in the United States and under the leasing act yielded nearly a half million dollars in royalty during the fiscal year 1930.

In connection with these estimates one may ask whether all the coal fields of the United States are known, and if their limits have been determined. Because of the field work of the Federal and State geological surveys, this question can be answered in the affirmative.

The question of how long the coal supply will last includes so many indeterminate factors that any prophecy as to the date of its exhaustion must be of questionable value. Although the authorities are sometimes alarmed because those highest grade deposits nearest to the industrial centers are rapidly declining, yet it is a safe generalization that we have sufficient coal in the United States to last our people for centuries to come.

The value of geology and geologists to the oil and gas industries is now clearly and generally appreciated, but in the earlier days the "practical" oil man looked skeptically upon geologists as a peculiar breed of theorizing dreamers who served no useful purpose. The discovery of the Cushing field in Oklahoma by geologists and its development in 1912-1915 was one of the events which convinced the most skeptical that petroleum geology has practical value.

Exploring Interior Alaska

Forty-three petroleum engineers and assistants are responsible for supervision of the development of oil and gas on public lands. During the fiscal year 1930 over $4,000,000 was paid into the Treasury for oil and gas royalties accruing on public land alone, while over $1,500,000 accrued as royalty from naval petroleum reserves in California.

In modern times the seat of empire, it has been said, has been determined by the distribution of mineral deposits. Coal and iron, sitting side by side, contribute most of all to its establishment. Copper, lead, zinc, petroleum, and aluminum are the five mineral commodities most important as supplements.

Aluminum Ore That Is Readily Accessible

In the production of all seven of these the United States stands first among nations. Thus her natural industrial advantage is overwhelming. But there are points of weakness in her position. There are certain minor minerals that she does not produce.

Field, laboratory, and office studies of the distribution and economic geology of the ores of these metals are carried on by the United States Geological Survey with a view to estimating and increasing known reserves, and stimulating production where it is in accord with sound economic principles and consistent with conservation of natural resources. By conservation is here meant the wise and efficient utilization of resources at all times.

The economic utilization of the metals that are plentiful and a search for and development of the supply of those that are scarce constitute a constant struggle of the Government.

It has been but 50 years or so since the steel makers began to alloy their products with those little brothers to iron which, being present in small quantities, give it one quality or another that it may better serve given purposes. Outstanding among these alloys is manganese. Stir seven pounds of it into a 1,000-pound pot of steel that is ready to be poured and, lo! It takes on new and superior qualities. The addition of ferromanganese to molten steel permits the manganese to combine with the dissolved oxygen and puts back into the steel the essential carbon which has been burned out. Added in greater proportion, it produces a tough steel that can be put on those teeth of the steam-shovel dippers that gnaw so knowingly into earth excavations, hard steel for the jaws of crushing machinery, resistant steels that may go into safes that defy the tools of the cracksman. It is one of the most helpful and generally used of all steel alloys.

There are deposits of manganese in Virginia, Georgia, Montana, the Ozarks, the Southwest, but more than 90 per cent of that used in the American industry comes from Russia, India, Brazil, and other foreign lands. Russia owns what are probably the largest and best deposits of manganese ore in the world. They are down in that other Georgia by the Caspian Sea and are the envy of all nations. Some 300,000 tons of manganese metal in the form of ores and alloys valued at $25,000,000 are brought into the United States every year.

Tungsten is another of these iron relatives used with peculiar results in alloying steel. Tungsten is a comparatively rare metal, but, while vital, the world can get along with relatively small quantities of it. The United States consumes only two or three thousand tons of it in a year, but spends a million dollars for it. World production is not more than 25,000 tons. Half of what is used in the United States is produced here. Burma, Indo-China, Bolivia, and Korea make their contributions.

Blast Furnaces in Which the Quality of Steel Is Improved by the Introduction of Other Metals

But this small amount of tungsten is necessary. It furnishes the filaments for our electric lights. It contributes a peculiar quality to steel that makes possible one of its most exalted uses. Tungsten steel is tool steel. It cuts other steel as a boy might whittle a stick. A tungsten steel tool may shape the barrel of a cannon or a drill of it may pierce armor plate. Tools that do this sort of cutting grow hot. Tungsten steel does not lose its temper, however, at temperatures that destroy the usefulness of tools made of other steels. They may be operated four or five times as fast as tools of carbon steel without being affected. They are masters of the steel world.

Chromium is another of these little brothers to iron that is used in hardening steel. Chrome steel is excessively hard. Armor plate for battleships is made of it, as well as armor-piercing projectiles. So are the barrels of guns, large and small. The automobile industry utilizes large quantities of chrome steel in gears and other parts requiring great hardness. It has the virtue of not tarnishing. Its qualities are different from those of manganese steel. The steel resulting from the introduction of one of these alloy metals or another into it has its peculiarities which give it special uses. Chromium itself is used on automobiles for bright plating because of its resistance to tarnish. Chrome yellow paint comes from it, as does the dye that colors khaki cloth.

There used to be a chromium mine just north of Baltimore. It has been quite worked out. There is a good deal of the ore scattered along the Pacific coast of America but largely undeveloped. Some of the best chromium mines in the world are in New Caledonia of the Kanakas and the coral reefs. There are other mines in Rhodesia, in Greece, and one in Cuba, not so far away. We import over 200,000 tons of crude chromite every year and pay around a million and three quarters for it.

The Geological Survey Is in This Middle Wing of the Department of the Interior Building in Washington

Here is a humble industrial artisan, graphite, which we must buy abroad. In the lumps which represent its most usable form it is picked up by strange people in Ceylon and Madagascar who are quite unlike the chic American stenographer who makes pothooks with cores of it running through bits of red cedar.

A Graphite Mine

Graphite is a carbon cousin of the diamond. In those formative days when the world was young it acquired a different habit from that kindred carbon which produced the smutty coal or the brilliant gem and became one of the softest and smoothest of minerals. It finds its way into lubricants, lead pencils, and stove polish. Strangely, unlike coal and oil, the other useful members of the carbon family, it is so resistant to heat that crucibles for metallurgical use are made from it. Nearly all of the crucible graphite used in the United States comes from mines that are in lands that are far away.

Asbestos Ore and Fiber

Asbestos is a fibrous material which may be spun into cloth. It is not inflammable and therefore has uses peculiarly its own. Curtains of it are rolled up at the front of theater stages and, in case of fire back stage, may be let down and will hold the flames in check. Mixed with a bit of clay, sheets of it may be put over the flame of kitchen stove to allow the victuals to cook without scorching. Collars made of a mixture of magnesia and asbestos may embrace the hot pipes that lead from the furnace, hold in and conserve the heat, and keep these pipes from setting the house on fire.

We import around 230,000 tons of asbestos every year—enough of it to load a freight train 40 miles long. Nearly all of it comes from Canada, just across the Vermont line, where the best asbestos mines in the world are to be found.

We pay Canada $8,000,000 a year for this asbestos. We may not always have to do so. Down in Arizona, near the Apache Trail and the Roosevelt Dam, are deposits that may sometimes become effectively productive. During the war as much as 1,000 tons of asbestos a year were taken out of these mines, but they could not compete with the Canadian properties when normal times returned.

Potash gets its name from the fact that it was once made from the ashes of wood leached in pots. Lye used by our grandmothers in making soap was its liquid form. In the laboratory potassium is a white metal. Its salts mixed in fertilizers supply certain deficiencies in soils and make crops grow more abundantly. Potash is one of that trio of indispensable materials—potash, nitrates, and phosphates— which goes into fertilizers. The cotton crop of the South, the potato crop of Maine would be hard hit if they missed their potash dosage for a single season.

A Potash Plant in Death Valley

Germany has potash deposits scattered through an area 140 miles wide and 250 miles long and so easy to work that she has been able for decades to control the potash market of the world. In 1930 we imported 342,071 tons of pure potash, which is not a very large amount. That same year our sales from domestic sources were over 60,000 tons. So we are at present dependent. Not that we do not have good prospects of attaining independence.

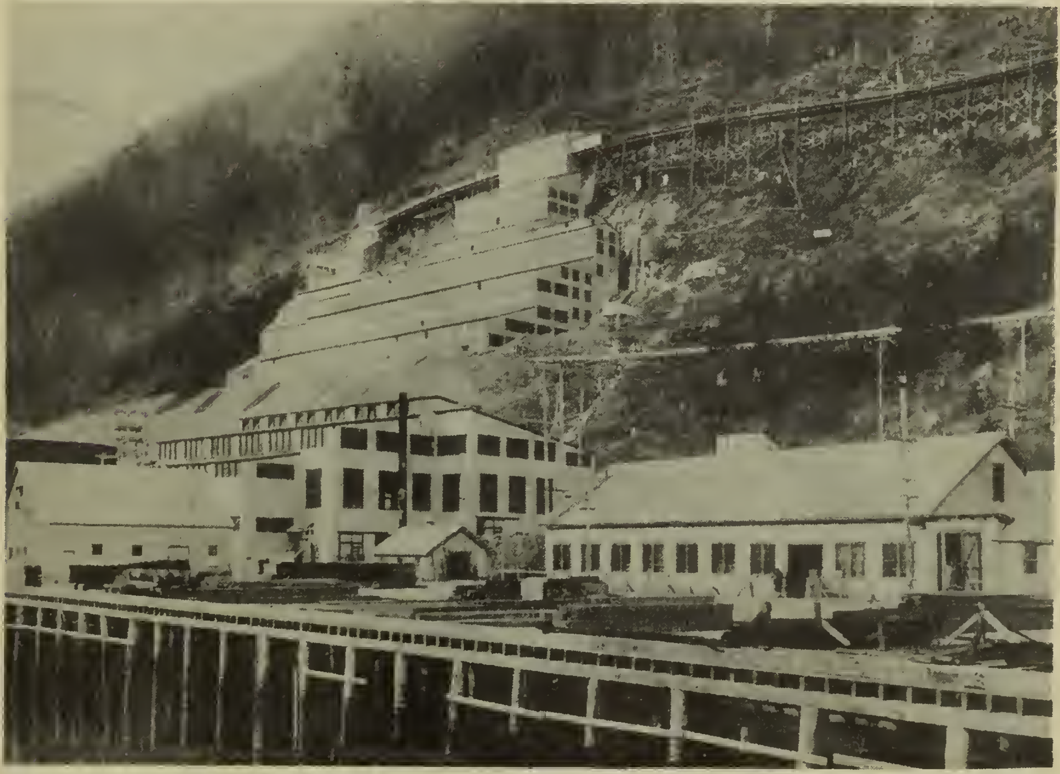
Down in the vicinity of Death Valley in California, for instance, there is a salt lake, 15 square miles in extent, hard enough on top to support a narrow-gage railway and an automobile road. Underneath is a spongy, salt mass, part solid and part liquid. Pump this liquid out and crystallize it and among the products are potash and borax. Commercial potash for use in fertilizer manufacture now is being produced here in competition with France and Germany. There might be enough potash in this one lake to last the United States for a generation or more.

There is a "green sand" strip running all the way across New Jersey that may perhaps be made to yield potash on a basis that will compete if experimental work recently authorized by Congress is successful. Within recent years the Survey, after 25 years of quiet study, has pointed out that the most promising area in the United States lies in the Permian Basin of the southwestern Great Plains. These deposits in New Mexico and Texas are not unlike those in Germany. One mine already has been opened in New Mexico and is shipping commercial potash salts into the eastern markets. A vision of potash independence can be seen a short distance ahead, but for the present much more of that product is being imported than is being produced at home.

The Geological Survey is attempting to point the way to a further development of all of these vital materials.

As a further practical example of the work of these Government specialists their study of iron ore deposits in the Birmingham, Ala., district may be cited.

The ore occurs here in beds that are mined from below ground. Formerly it was the mining practice to take only that portion of the ore bed that was of the best quality and leave below the portion that was mined one-third to one-half of the bed that was of lower grade. When the workings have been driven further on, the pillars of ore robbed, and the roof has caved down this lower-grade ore is lost beyond recovery. If the production of a mine could be increased 50 per cent by mining the lower part of the ore bed the gain would not only affect tonnage but the cost of ore extraction would be reduced by retarding

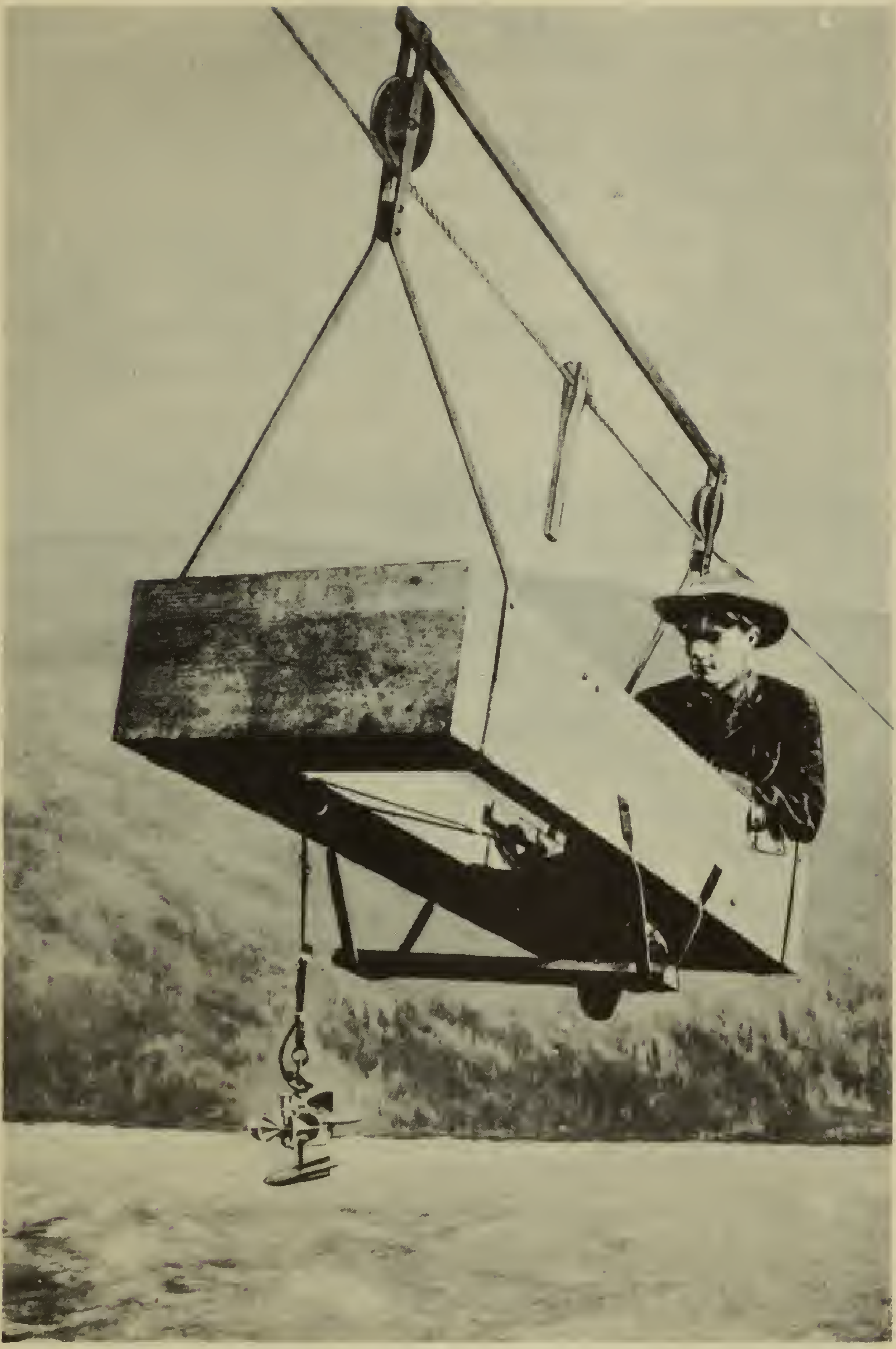


A Rich Gold Mine at Juneau, Alaska

the extension of mine slopes and rooms. Representations by the survey have helped to remedy this condition.

Such problems involve consideration not only as to whether it will pay at the moment to reduce average grade of ore for the sake of greater recovery, but also have bearing upon future supplies and the life of the mining district. They also involve questions of conservation of human life and energy. Arguments advanced were that according to the current methods of mining and timbering it would be inconvenient, if not dangerous, to mine a greater thickness of ore and that it might result in more ground water entering the mines. Additional supplies of water for industrial purposes are, however, needed badly, and water entering the mine because of enlargement of stopes could be pumped out and recovered, so that in this proposed conservation of ore lies an opportunity also for the conservation of water. Fortunately mining methods are subject to change. American mining engineers are resourceful, have access to the experience and practice of other districts, and are able to overcome serious obstacles to progress. In this lies the hope that full conservation of ore may eventually be effected here.

Practical conservation, in its broadest sense, is constantly in the minds of the Survey's geologists who investigate metal-mining districts. As generally thought of, conservation of mineral resources implies the leaving in the ground of all that is not immediately needed and involves an acquaintance with mineral reserves and market conditions both in this country and in the world. The occurrence of mineral deposits, and therefore the existence of mineral reserves, is a geologic problem, and the relative availability



A Geological Survey Outfit for Determining How Much Water Runs Down a River of reserves is both a geologic, technologic, and economic problem, in which the Geological Survey has a fundamental share.

The Geological Survey, also, has long been the Government's guardian of water-power sites.

More than 6,000,000 acres of public land are now included in power-site reserves whose use will be required in the development of about 15,000,000 continuous horsepower. About 5,500 miles of rivers have so far been surveyed in connection with the classification of lands. Either before or at the time of the survey a field examination of the river is made to select possible dam and reservoir sites, and these are surveyed on a somewhat larger scale than the remainder of the valley. The dam and reservoir sites are also examined by geologists to obtain information as to their safety from a geologic viewpoint. When the data resulting from these field investigations and surveys are assembled with stream-flow records, estimates of the potential power of the river are prepared and plans for developing the power are outlined in a water-power report. All of this is part of the work of the survey in its work toward conserving this great resource.

The Geological Survey goes into that western area of the public domain and finds out which lands are agricultural. In the semiarid plains east of the Rockies 95,000,000 acres of such land, an area equal to three Pennsylvanias, has been classified as possible farm land. West of the Rocky Mountains and extending to the Pacific-Mountain system lies a region which contains most of the remaining public domain. Climatic or physical conditions in this region in general are unfavorable for dry farming, and the only agricultural utility of the greater part of the land is for grazing. The grazing resources, therefore, are the dominant economic factor in land classification, but in making it the dominant type of forage growth has been indicated. This classification, consequently, discloses the location of grazing lands best adapted to summer, winter, as well as spring and fall use, together with the amount of livestock which can be supported by grazing during these seasons without serious impairment of the normal vegetative growth.

Summer Work With the Geological Survey

It is estimated that the total annual income derived from livestock products in the West includes an increment of nearly $10,000,000 solely obtained from these forage resources. This increment is being obtained despite a gradual decrease in normal forage growth over a long period as a result of overgrazing and lack of efficient use of the supply now annually available, both evils being incidental to the present lack of management of the range.

It is estimated that under proper management the value of the native forage growth of the livestock industry can be increased with a minimum of effort to at least $15,000,000 a year.

It Was This Sort of Advance Work on the Colorado River That Made Way for Hoover Dam

As the United States has more and more outgrown its early youth, there has developed a deepening consciousness that the supplies of many of its resources, although generally very great, are not inexhaustible. Inventories of the supplies of these have been made, and consideration has been given of ways and means to assure the greatest possible benefit from them. The majority of people in the United States, for example, have supplies of water on tap in one way or another which seems so ample in relation to immediate personal requirements and so relatively free as to make that article comparable in adequacy and availability to the air we breathe.

In the arid regions, however, the available water supply may be an important limiting factor in industrial and urban development and particularly in agriculture. It is commonly known that in many parts of the West there is more land of desirable quality than there is water to irrigate it. Although most cities of the arid regions have excellent water supplies, it is obvious that the difficulty involved in obtaining an adequately large water supply, if nothing else, would be a serious obstacle to the growth of numerous western cities into future New Yorks or Chicagos. Indeed, the same statement is more or less applicable to many eastern cities. Thus the experiences of the inhabitant of the arid regions have educated him to the conception that water is an important resource. Circumstances have not impressed this realization so strongly on the dweller of the humid regions. It requires something unusual as a drought or a flood to make him conscious of water as something about which "something should be done."

An extensive practice of cooperation has been developed between the Geological Survey, which furnishes the expert investigational service, and other Federal bureaus, States, and municipalities which require the information. In each instance the activities relate to the collection of information either directly about water or which has important bearing on the guidance of utilization. This lays the foundation for water conservation.

The topographic maps prepared and published by the United States Geological Survey, a striking example of the graphical presentation of facts, provide a basis for the study of many problems of conservation. A topographic map is a layout in small compass of many, often hundreds, of square miles graphically depicting all the works of man and of nature in their correct relation one to another.

Topographical Mapping from an Elevation of 10,000 Feet in the Sierra Nevadas

The facts so presented are not only useful but are essential to most scientific and engineering studies which are affected by the lay of the land. Topographic maps supply accurate information for many administrative purposes; provide a basis on which to study and record geologic and other scientific data; supply data for the study of the relative merits of alternative locations for highways, railroads, transmission lines, pipe lines, canals, etc.; show locations suitable for storage reservoirs for public water supplies, power, irrigation, and flood-control purposes; accurately delineate the extent and character of watersheds, supplying data necessary for the allowance of proper bridge openings, and the design of channel cross sections for flood and drainage purposes; provide essential information for city planning and the many engineering problems connected therewith, and afford a good base on which to assess property values; serve as a base on which to study soils, the environment of insect pests, disease epidemics, archaeology, geography, botany; and are absolutely essential for military purposes in the national defense.

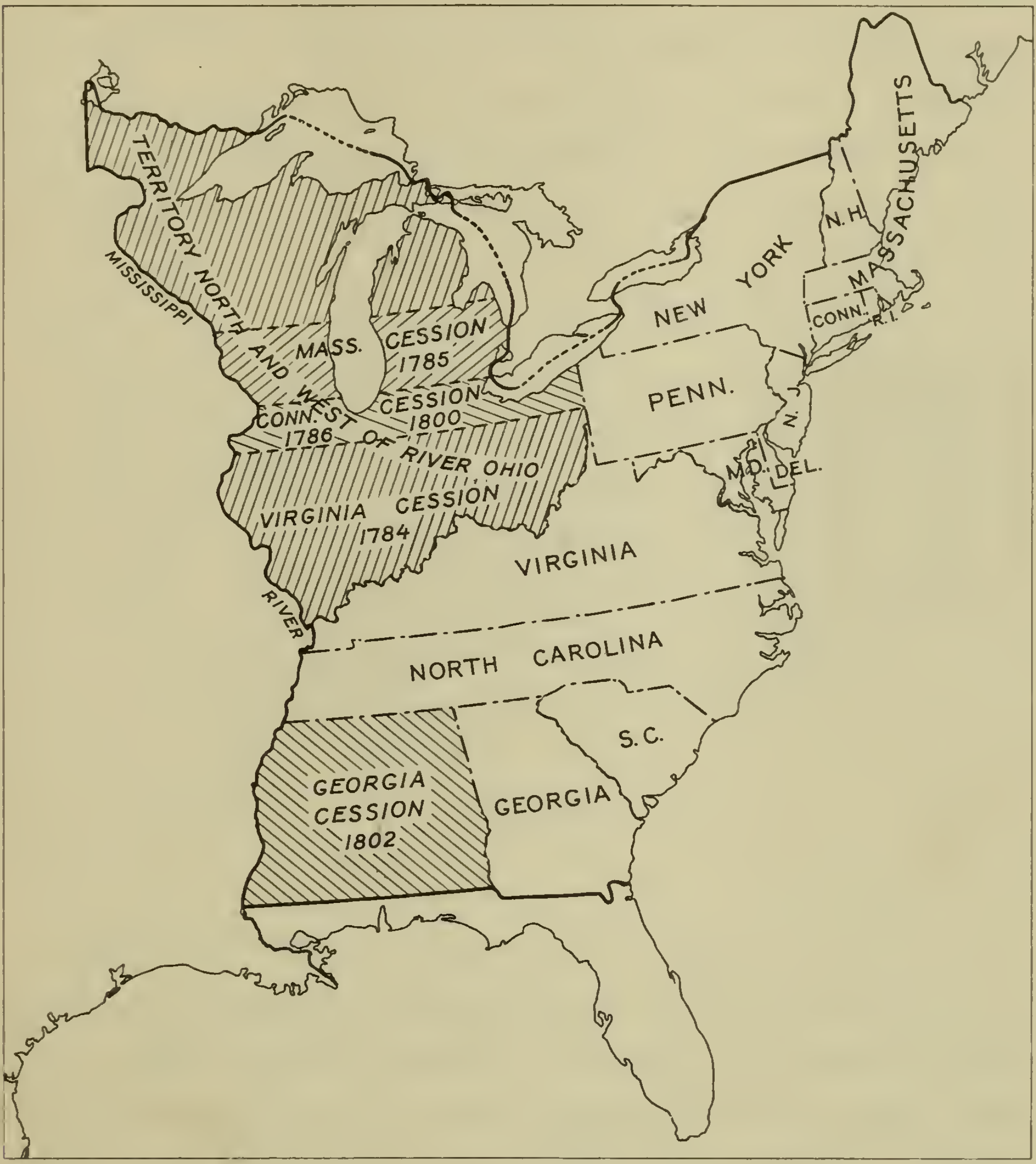
The development of topographical maps to cover the entire country is a continuing project that goes on through the decades and the completion of which rests with posterity.

CHAPTER XV

CONSERVATION BY THE GENERAL LAND OFFICE

THE General Land Office in the Department of the Interior has been the real-estate agency of the Government almost from the moment when there first was a government. It began offering land for sale in 1785 and since that time has disposed of about three-fourths of the continental area of the United States. Roughly speaking, it has sold all the land north and west of the Ohio and Mississippi, plus Alabama, Mississippi, and Florida, with the exception of Texas, which retained its public lands when it joined the Union.

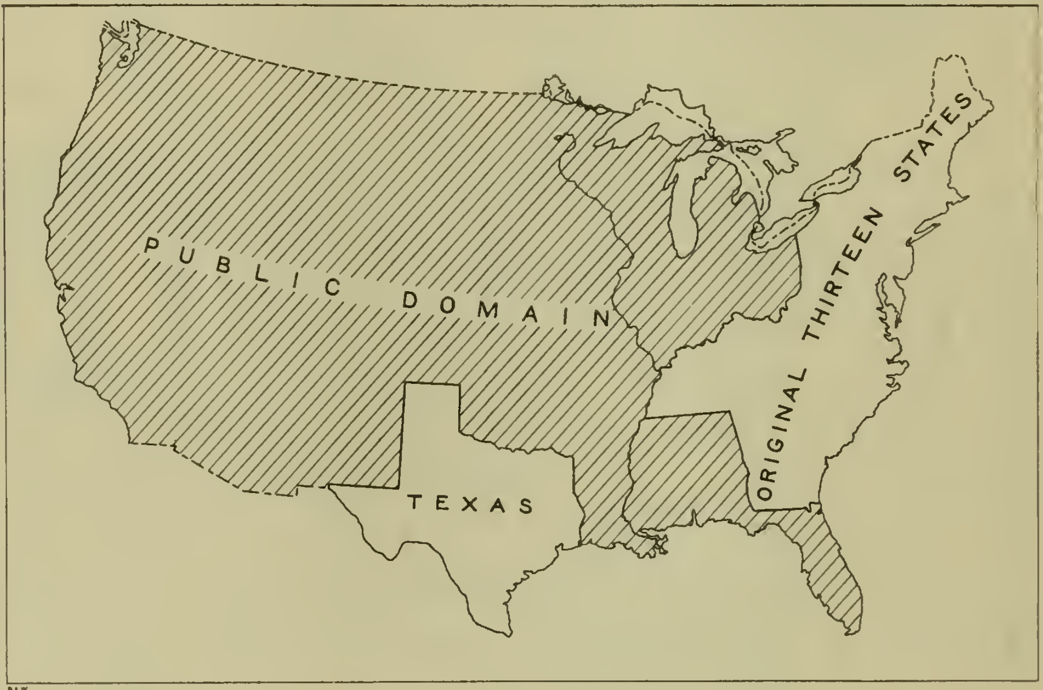
When the original thirteen Colonies became States under the Constitution they kept their own lands. Several of these States, however, owned lands running to the Mississippi. About the time they came into the Union under the Constitution they gave up their title to this land, and it became public domain, belonging to the Federal Government. When Florida and Louisiana later were purchased all their lands that had not gone into private ownership were added to the public domain. The Louisiana Purchase included all that fertile area in the Mississippi River drainage basin west of the river. Unappropriated lands in those areas acquired from Mexico, and in Oregon and Washington acquired through exploration, also



Ceded Lands of the Original States

became part of the public domain. Thus was an empire set aside for later development.

In 1784 the Continental Congress appointed a committee headed by Thomas Jefferson to draft "an ordinance for ascertaining the mode of locating and disposing of lands in the western territory." A report of that committee in the handwriting of Jefferson himself recommended a plan, new under the sun, for surveying and selling this, the most valuable stretch of land in all the world. A pattern was made by which the map of the Nation was to be cut up in an orderly way that would make it possible that any bit of it anywhere could be conveniently located and a fence built around it as the tide of settlers rolled westward to the Pacific coast. All lines were in accordance with the cardinal points—ran north and south, east and west. Jefferson, being an enthusiast for the metric system, drew a plan which provided a checkerboard for the entire country with blocks 10 miles square, each divided into 100 sections, 1 mile square. The New England township, which was 6 miles square, had come into general acceptance, however, and it later became the basic measure. With the location of base lines and principal meridians and the designations of townships, ranges, and sections, it became possible

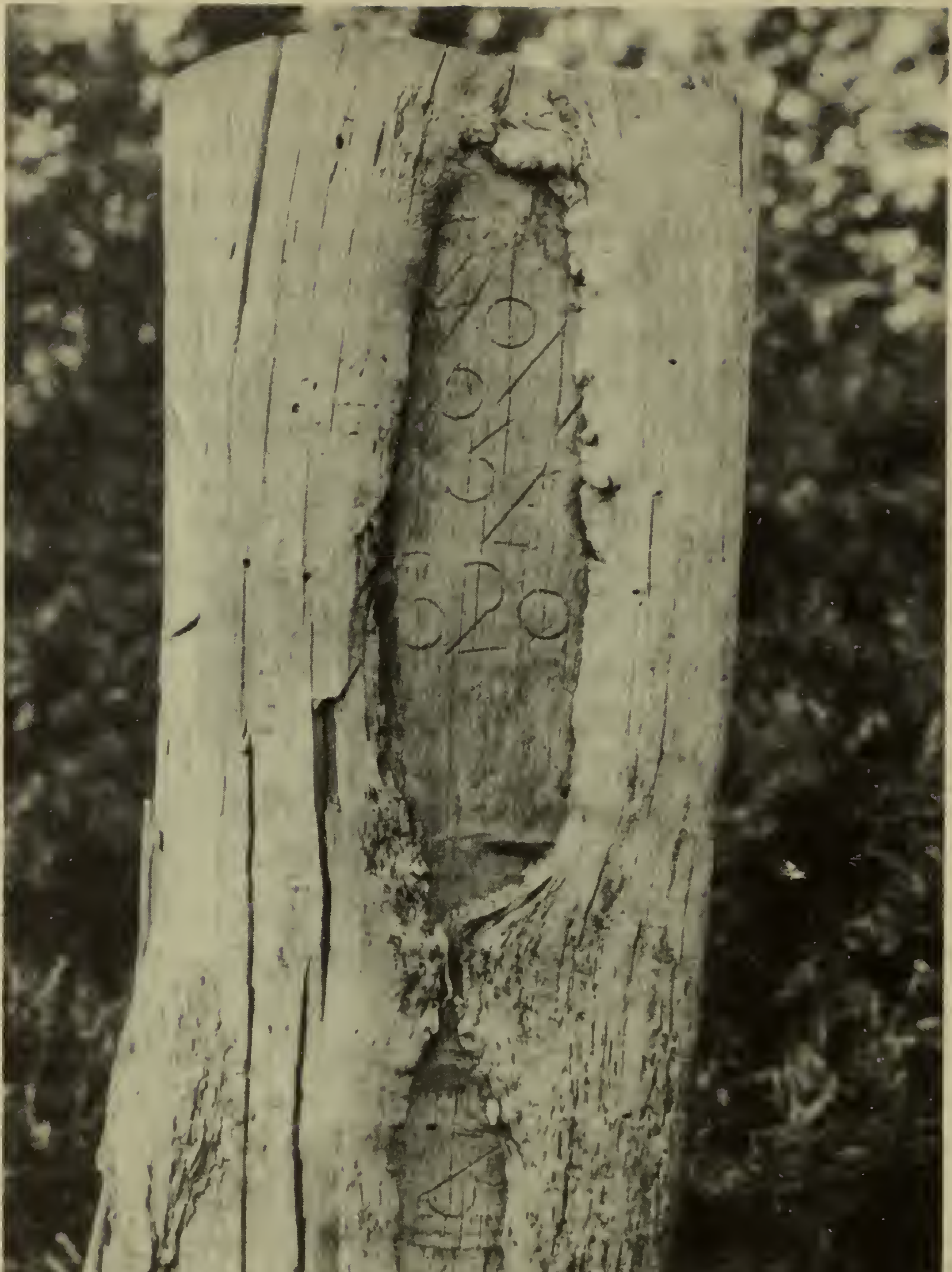


The Public Domain That Has Been the Charge of the General Land Office conveniently to identify any tract of land anywhere and give it a place on the map. The public-land States were laid out on this rectangular plan, admittedly the most convenient scheme ever devised by any nation.

The first township of public lands to be surveyed in the new Nation was in 1785. It was based on Ellicott's line, which was the boundary between Pennsylvania and Ohio.

The survey of the public domain has gone forward steadily from that day to this and is yet far from completed. Roughly, a survey by the General Land Office contemplates the location of every square mile of land and the placing of a permanent monument at each of its four corners and a monument half way down each of its four sides that crosslines may be run establishing the boundaries of quarter sections. The area between the Ohio River and the Pacific, between Mexico and Canada, is so vast that this task of marking out all these sections has proven almost without end. The work has gone steadily forward through the decades for nearly a century and a half, sometimes consuming appropriations of more than a million dollars a year. In the beginning there were some 2,000,000,000 acres of this public land in continental United States. About 140,000,000 acres are still unsurveyed. The Government at present is spending around $700,000 a year in continuing these surveys.

Government lands were at first sold at auction for cash, the purpose being to raise money for payment of the public debt. Settlers were discouraged from locating on these lands, as this might interfere with sales. The first step toward the best use which constitutes conservation came in 1820 when a "preemption" law was passed under which



A Section Corner Marked on a Tree in 1864 and Photographed 62 Years Later the settler on Government land acquired first right to buy it at $1.25 an acre. In 1862 the homestead law was passed. Under it a bona fide settler, a citizen of the United States, might acquire title to a quarter section of Government land by making his home on it for a period of five years. This law, withholding public lands for legitimate home makers, is held by many to have turned out to be the greatest of all conservation measures. It was under it that those hordes of settlers which swept west at the close of the Civil War found permanent homes with their feet in the soil.

As early as 1873 forestation found a place in the administration of the Land Office in the timber culture act, which made possible the acquisition of Government land as a reward for planting trees on it. Timberlands were withdrawn from settlement in 1891 and a division of the Land Office administered them until the Forest Service was created more than a decade later.

In 1909, 47 years after the passage of the homestead act, it came to pass that most of the good farm land between Pittsburgh and the Pacific had been appropriated, quarter section at a time, by settlers. The activities of the Land Office had kept pace with the frontier while settlers overflowed into State after State. The usual action of the Federal Government has been to distribute land resources into private hands as fairly and rapidly as possible. Certain artificial conceptions, such as that of the acre, have been used in dividing up our continent just as we have divided up our cities into town lots of arbitrary size and shape. This has been done largely regardless of the quality of the soil, the amount of vegetation, the water supply, the climate, or those other factors upon which all of the values of the soil, in so far as the habitation of human beings is concerned, depend. The result of this has been that there has been a large marginal failure in almost every zone throughout the country. In the best areas of the Middle West this process has not been so evident, but throughout the Rocky Mountain region and the Western States the tragic skeletons of abandoned homes tell the gaunt and heartless story of human hardship and of a contest with nature doomed to failure. Purely artificial procedures and arbitrary decisions are not apt to fit well unless all the conditions are favorable. This whole sad process of failure could have been avoided if we had understood the problems of spreading a great population over a continent for successful living.

The Scene of a Settler's Fight for a Home

Yet despite all of this the smoke of contentment curls from a million chimneys where previously desolation reigned. There still remained in 1909 a type of land capable of being cultivated by dry-farming methods that was not taken by settlers because a quarter section of it would not produce enough to support a family. If two quarter sections, side by side, could be acquired, a crop might be made each year on one of them while the other lay fallow and conserved its moisture. An enlarged homestead act was passed permitting the settler to file on 320 acres. Thus did a great area of border-line lands pass into the hands of homesteaders. In 1916 the stock raising act was passed providing that a 640-acre unit of land suited to the purpose might be acquired by settlers whose inclinations ran to cattle or sheep. Thus was another tier of lands opened to settlement.

Yet another land law passed as early as 1877 permitted "desert-land entries." A citizen might file on a tract of desert land. To get a patent to it he must find a way of getting water on it, of actually cultivating it. The land would be given to whoever developed a one-man reclamation project. This act represented the Government's first effort toward the encouragement of irrigation. In 1894 the Carey Act was passed which turned over to States, under prescribed conditions, lands to reclaim where cooperative irrigation projects might be developed. Then finally, in 1902, the Federal reclamation act, under which the

A Reclamation Home

Government advanced the money for projects too big to be otherwise handled, came into being. It has brought water to various sagebrush plains from Canada to Mexico and has distributed under careful supervision the fertile lands which, before it waved its wand, were barren wastes.

From the vastness of his public domain Uncle Sam has dispensed largesse with a bountiful hand to those activities which have seemed to him in the public interest. Having early acquired an enthusiasm for public education, he began in 1802 to set aside public lands in the new State which he cut out from his acquired domain in the West certain areas to be conserved for school purposes. When Ohio came into the Union, section 16 of each township was given her for the support of her schools. The 12 States that followed her were on the same basis allowed 1 square mile out of each 36 as a school section. As time passed the Federal Government grew more liberal in its contributions to public education and gave to a score of States following these two sections in each township. As the States finally filed into the Union and it became Utah's turn to make her entrance, she was given for school purposes four sections out of each township. Like amounts have been given to Arizona and New Mexico as they came into the Union. The sum total of this area which was given to the States for educational purposes is so vast as to be hard to comprehend. It makes up a land surface that is equal to all of New England, all of the Middle Atlantic States plus North Carolina and Tennessee.

Beginning in 1849 the Federal Government transferred title of all public swamp lands to the States. The area of all such lands amounted to 65,000,000 acres, or the equivalent of two New Yorks. In Florida 20,000,000 acres out of 38,000,000 were shown to be swamp land and turned over to the State. An area equal to Texas has gone into Indian reservations. Two and a half Connecticuts have been set aside as national parks. Finally there were the grants of lands to transcontinental railroads that they might be induced to build lines to the Pacific coast, thereby developing the country, which amounted to an additional 135,000,000 acres of land, the equivalent of four States like Iowa.

Some of the Public Domain That Nobody Wants

Thus has the public domain melted away. In the beginning, in round numbers, there were 2,000,000,000 acres of it. To-day one-tenth of it, around 200,000,000 acres, remains, as much of the earth's surface as lies in Iowa, Missouri, Illinois, Wisconsin, and Indiana combined, and with it the problem of its proper administration, from the standpoint of conservation, that the greatest good to the general public may accrue. Of this land a considerable portion still must go to those railroads to which it was granted but to which title has never been transferred because the land has never been surveyed. There are 220,000 sections of land yet to be surveyed and marked with monuments at their corners and halfway down their sides. This completion of western surveys, on which nearly $1,000,000 a year is being expended, is one of the continuing large tasks of the General Land Office.

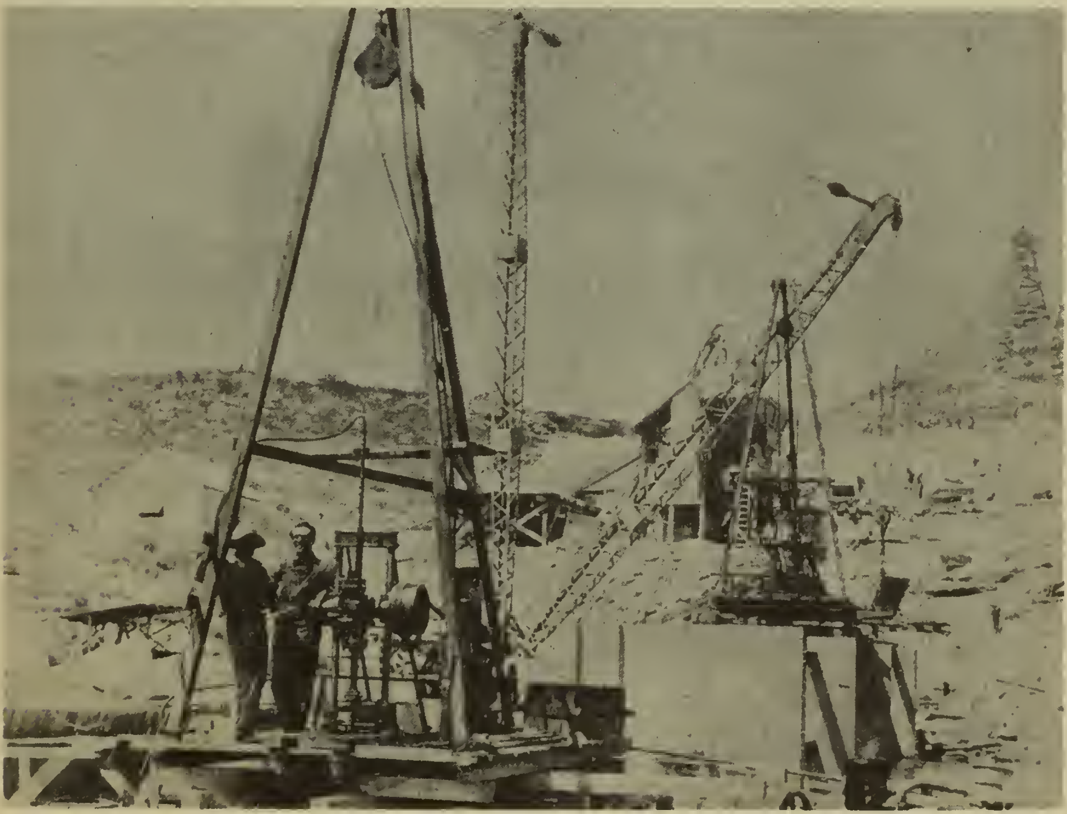
A Point of Vantage for Government Surveyors

While the sand largely has run through the hourglass for the agricultural lands of the public domain there still is much mineral wealth in them, and responsibility rests on the Government's real-estate office for such disposal of this wealth as to get proper money returns from it and so to prevent its waste as a national resource. From the beginning the Government retained mineral lands, probably on the old English theory that precious metals belong to the crown. When gold was first discovered in California there was next to nothing in existence in the way of mining law. New mining communities became entirely self-governing, struck out boldly, and made their own regulations; some of them were far from orthodox. One, for example, provided whipping and banishment for practicing lawyers, and death for horse and mule stealing.

From these beginnings mining laws later evolved. It came to pass that under the law claims on these lands might be located, worked, and patented. A placer claim might cover 20 acres, a lode claim might cover a strip 1,500 feet long and 600 feet wide. The individual might stake out a claim, file his papers in a county office, and take out great wealth with no more ado. Five hundred dollars' worth of development work and $5 an acre were necessary if he wanted to get a patent. This simple scheme was the backbone of the early mining industry which had to do largely with the precious metals. It was quite adequate even after copper mining became important. Eventually a new law was passed allowing larger but still inadequate areas to be taken as coal land. With the appearance of oil as a new liquid gold, lands bearing it were acquired as placer claims. The production of coal required large land areas and expensive organizations. Oil discovery often was a large undertaking requiring a heavy investment. It cost $250,000, for example, to put down the discovery well at Kettleman Hills. A discovery might inadequately reward the man who made it but enrich holders of land roundabout without effort on their part. In the realm of coal the dummy entrymen, backed by an organized special interest wanting to acquire large areas, became a scandal early in this century. Existing laws were inadequate. Pending the enactment of new laws, large areas of lands believed to be valuable for coal, oil, and fertilizer minerals were withdrawn from entry. A controversy arose out of which grew, in 1920, the enactment of a Federal leasing act for coal and oil lands to supersede the old mining claim procedure. It is in the administration of this law that the Land Office becomes one of the practical conservators of the Government.

Oil Shale Areas in Colorado

Under the Federal leasing act the title to coal and oil lands remains permanently in the Government, but the minerals that lie in them may be produced on a royalty basis. The procedure in the case of coal is something like this: The Government blocks out an area which, considering the local circumstances, is regarded as a fit unit for development. Such a unit is likely to be 4 square miles in extent and therefore to cover 2,560 acres. This unit is studied by the Geological Survey, its possibilities are estimated, and a lease is written covering it. This lease may require the development of a plant to cost $10,000 or $50,000. It will call for the production of certain minimum amounts of coal per year, which might be 1,000 tons or 10,000 tons. It will specify the royalty per ton to be paid to the Government, which royalty may vary in proportion to the difficulties in mining the coal. Whether the coal is



Drilling for Oil Under Government Permit mined or not, the lease holders must pay royalties on the minimum quantities specified. Thus it becomes unprofitable that coal lands should be held under lease and not worked. When they cease to be worked the lease terminates and they come back to the Land Office.

A Government Party Reconnoitering the Public Domain

The basis upon which the oil lands are handled under the Federal leasing act is a little different. A permit to prospect may be secured for coal lands, but usually prospecting is not necessary, as the presence of the coal is obvious or has been established by the Geological Survey. In the case of oil, however, the permit to prospect is almost always the beginning of an individual's contact with the Government and an important preliminary to a lease. An applicant for a permit to prospect is likely to have 4 square miles of supposed oil land assigned to him. In three months he must stake out its corners. In six months he must have his rig ready to sink an oil well. In a year he must be down

500 feet. In two years, unless he strikes oil at a less depth, he must be down 2,000 feet. His permit should work itself out in two years, but extenuating circumstances may arise under which he may get extensions of the permit up to seven years.

If under this permit to prospect the applicant discovers oil, 20 per cent of all that is produced prior to his obtaining a lease goes to the Government. His discovery entitles him to a lease under which he may get one-fourth of the area covered by his permit on a basis of 5 per cent to the Government. He may also secure another lease for three-fourths, but he must pay a royalty to the Government which ranges from 12½ per cent to 33⅓ per cent, depending on the quantity and quality of the oil produced.

Land leased for either coal or oil remains the property of the Government and returns to the Government when the lessee ceases to produce from it. Thus it remains an asset to the Government for indefinite periods.

As it works out, there lies in this leasing act certain possibilities in the field of conservation that do not appear on the surface. The overproduction of oil had become a menace to the industry before President Hoover came into office. He had been at the helm but seven days when he stopped the issuance of permits to prospect on the ground that there was no occasion for the development of more oil production where there was already too much. This resulted in a certain amount of conservation, but it served a still larger purpose in the example that the Government under the circumstances set to all producers of oil. Later the influence of leased lands was brought to bear in bringing about unit operation at Kettleman Hills. A bill was passed in 1931 specifically authorizing the Secretary of the Interior to enter into such agreements for unit operation.

The administration of the General Land Office is one of those few activities of the Government which results in a continuing profit to it. During the decade between 1920 and 1930 the receipts of the General Land Office from all sources amounted to $105,000,000. The expenditures in the operation of the Land Office for the same period amounted to $27,000,000. Thus it appears that there was a profit of some $78,000,000 during this 10-year period of operation. Every time the Land Office spent a dollar it collected four. About 75 per cent of the total receipts are rents and royalties from leases of coal and oil lands, while the remaining moneys result largely from sales of public land. Of the coal and oil money, 10 per cent is retained by the Federal Government, while 90 per cent is divided between the reclamation fund and the States in which the

A Land Office Field Camp

coal and oil is produced. Under this division the reclamation fund gets 37½ per cent of the total and the States get 52½ per cent. Of the money received from the sale of public lands, 5 per cent goes to the States in which the lands lie and the balance, but for small exceptions, to the reclamation fund. Thus does it work out that practically all of the money that is secured from these natural resources is returned to the Western States and spent in them.